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# A SPACE ODDYSSEY

*Space Tourism: opportunities and challenges of an emerging industry*

Space tourism or commercial space travel will revolutionise the future of the global aviation industry. Recently, Elon Musk, the founder of SpaceX announced that his company has received deposits from two private travellers to travel around the moon in late 2018. Over 1000 people have paid their deposits to make suborbital journey with Virgin Galactic. It is important to track the developments of the emerging space tourism industry. There are several questions centred on the space tourism industry following the changes in the political and economic landscape globally. These include the slow reduction of US funding to government programs leading to the scale down of the operations of the National Aeronautics and Space Administration (NASA), rapid development of the space industry in India and China, Brexit in the UK and related negotiations with the European Space Agency, changes in the leadership of the US and UK governments and the looming economic stagnation in the UK.

In these circumstances, this brief article evaluates the progress of the commercial space tourism industry following the setback caused by the Virgin Galactic crash in 2014 and debates the status of opportunities and challenges in current political and economic situation whilst emphasising research directions for researchers in this field.

## Space tourism concept and evolution

The commercial space market including manufacturing and launching of earth observation satellites, communication satellites and transportation of crew and cargo has existed since the 1970s. The idea of travelling to space for new travel experiences has only started to become a reality when Californian businessman Dennis Tito travelled into space as the first commercial astronaut in 2001. Until then this commercial travel experience was reserved only for professional space travellers who were trained by government space agencies, such as, NASA, Russian Federal Space Agency and the European Space Agency (Seedhouse 2008; Reddy, Nica and Wilkes, 2012). However, the concept of space tourism became familiar after the commercial sub-orbital travel initiatives of Richard Branson through his space tourism company established in 2004, Virgin Galactic. There are also other companies involved in orbital activities including carrying payload and astronauts to the International Space Station.

**Image:**  
VMS Eve (Virgin Mother Ship)  
carries VSS Unity (Virgin Spaceship)  
for its first flight ever over Mojave, CA  
on Thursday September 8, 2016





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Today, people in developed economies are generally aware of the emerging space tourism industry from initiatives that are already in the making. Fast developing economies such as China and India have their space programs and there is some awareness in these countries too, although it is difficult to evaluate the level of awareness. On the whole, we need better understanding of the principles and characteristics of space tourism. Cater (2010) outlined an early typology for space tourism activities under three categories. Astrotourism that covers space travel beyond earth orbit and in the earth's orbit, including Lunar and Martian voyages, orbital flights (350 km) and sub-orbital flights (100 km). Atmospheric space tourism covers high altitude jet flights (20 km) and weightless flights. Finally, terrestrial space tourism covers specific space tourism sites including simulations, space centres and non-site specific space tourism activities, such as, virtual and gaming environments and popular culture space movies (Cater, 2010).

As a recent development, the announcement by the UK government in 2014 of the need to identify the most suitable location out of eight potential sites for spaceport was greeted with enthusiasm by UK space business firms and employees. The two reports by the Civil Aviation Authority, the 'UK Government Review of commercial Spaceplane Certification and Operations Technical Report' (321 pages) and the 'UK Government Review of Commercial Spaceplane Certification and Operations: Summary and Conclusions' (CAA, 2014) highlighted some of the long-standing aspirations and opportunities of the commercial space industry. The UK space industry as a whole is worth more than £11 billion and employs around 34,000 staff. It is expected to increase to £40 billion in 2030 offering employment to over 100,000.

However, the announcement by the UK government in 2014 and the consultation process that will last until 2018 before one out of the eight potential spaceport locations is identified, represents a delay considering that SpaceShipOne testing was launched by Branson's Virgin Galactic in June 2004 – a decade before in New Mexico, USA.

The proposed UK Spaceport will be only a tiny part of the UK space industry though the primary use of a spaceport will be seen as providing a means of launching small satellites into space on a lower cost basis than currently available. RAF Lossiemouth and Kinloss Barracks in Scotland are presently off the government shortlist for reasons related to defence operations. A detailed examination on the overall investments and economic growth in the selected spaceport location, actual employment, cultural influences and environmental consequences need to be assessed. Spaceport is not only about launching satellites, engineering and technological advances but also about human beings flying to the space for commercial purpose and thus, it will impact on the environmental and socio-economic profile of the selected location.





### Risk involved and cost of space travel

Early reactions from the industry indicate that there is clarity needed in terms of the risk involved and cost of commercial space travel. Notably, in 2014, Virgin Galactic's first spaceflight SpaceShipTwo crashed during experimental test in the Californian desert. This accident was debated much and sceptics argued that it would take many years for the space tourism operations to begin. The supporters of the space tourism concept however advocated that the project should continue. For instance, Jeremy Clarkson, a famous broadcaster and motoring writer in the UK argued that if the humankind had given up when encountered a problem in the past, 'we'd be all be living in caves' (Clarkson, 2014). Clarkson's views were echoed by many of the experts in the space industry. A more drastic outcome of the investigation may have only been a slowdown in any commercial plans for the next few years as this industry is supported by a number of private companies (SpaceX, XCOR and EADS Astrium, for example) and are likely to continue to develop space tourism plans.

Scientists such as Professor Stephen Hawking of the University of Cambridge supports Mars exploration and believes that a human settlement on Mars will take place by the end of this century, arguing that human beings need to have a 'Plan B' if anything happens to earth (National Geographic, 2016). Hawking sees settlement in other planets is a way forward to reduce the growing pressure on earth's limited natural resources and the needs of the growing population.

In 2015, the US Government's National Transportation Safety Board concluded the investigation of the Virgin Galactic crash, pointing to an error committed by the possibly anxious and inexperienced co-pilot who had unlocked the spacecraft's braking system early. Two years after this first spacecraft crash, the second SpaceShipTwo developed by Virgin Galactic has completed successful test flights and landed safely in Mojave, California in 2016 and in early 2017.

Although SpaceX team works closely with NASA and flies' cargo and crew to the International Space Station, the founder of SpaceX has not completely ruled out the risk factor in his announcement on 27th Feb 2017, to fly two private passengers on a mission around moon in late 2018. Elon Musk stated that the company's 'success rate is actually quite high' and that these two passengers 'are entering this with their eyes open, knowing that there is some risk here. We'll do everything we can to minimize that risk. But it's not zero' (Davenport and Achenbach, 2017). Clearly, risk will be one of the key factors influencing the success of space tourism.



Clockwise from top left:  
A SpaceX launch  
UK spaceport locations  
WhiteKnightTwo carrier aircraft, VMS Eve and SpaceShipTwo in hangar at Spaceport America  
Virgin Galactic Spaceship Two

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## RESEARCH ISSUES NEEDING TO BE CLARIFIED FOR THE EMERGING SPACE TOURISM INDUSTRY:

1. Clarifying the notion of 'space tourist' and taking the human risk factors and insurance issues into account
2. The 'actual' future demand for space tourism market. Private companies have carried out market research but are reluctant to share
3. Space tourism awareness – the attitudes, interests and scientific knowledge of the public
4. Many motivational theories have been applied to explain and understand tourists' motivation in the past but not yet in relation to space tourism
5. Risk is one of the significant variables in space travel. There is clearly a need to explore the role of the risk factor and understand customer perceptions in order to identify resilient space travel markets and their impact on the space tourists' decision-making process
6. Liability and insurance issues - difficulties in getting travel insurance and the demand for more information from the banking and insurance sector as well as assurances from the private companies
7. The implications of health aspects, psychological issues, sufficient training and training time-frame need to be explored
8. The implications of the European Space Agency legislations on the UK industry following Brexit and the future possibilities of commercial launches from new locations need to be researched
9. A detailed examination of the overall investment and growth in the near future in the new / potential spaceport locations
10. Possible carbon footprint of space tourism activity though there are plans to use Methane or Oxygen for commercial spacecraft and there will be less NOx and CO2 emissions


(Adapted from Reddy *et al.*, 2012)



Clockwise from top:  
Virgin Galactic's first  
SpaceShipTwo during its first  
supersonic powered flight  
SpaceX's Dragon capsule,  
scheduled to take tourists  
around the moon in 2018  
SpaceX's CRS-10 Drago







*Spaceport is not solely about the engineering and technological aspects but also about human beings flying to space for commercial purpose. Therefore, clarity will be needed in relation to developing space journeys long before they actually generate real income to the companies offering them. There are serious academic debates yet to come in this area*

The cost of commercial space travel is very high, and this is another important aspect at this point in time. A trip with Virgin Galactic will cost \$250,000 for about a two-hour experience and the cost has not been revealed for the forthcoming trip around the moon with SpaceX. But the price is expected to drop when more trips organised and more private companies operate triggering competition in this expensive niche industry. In an article appeared in *The Telegraph* (Leadbeater, 2016), the former NASA astronaut Don Thomas, who flew four missions on the Space Shuttle commented:

'You're going to see the price drop. To go to the Space Station now, as a tourist – you pay the Russians \$65 million. With Virgin Galactic, the price comes down to a quarter of a million dollars. I would think that, in a decade or so, you will see flights to space for \$10,000 to \$15,000. Space travel will be more in line with an exotic trip to Antarctica'.

The industry is going through an interesting phase with initiatives mainly from three companies, SpaceX, Virgin Galactic and Blue Origin. The clarity around risk and costs will emerge as the industry progress.

A 2012 article entitled 'Space tourism: Research recommendations for the future of the industry and perspectives of potential participants' in *Tourism Management* (Reddy *et al.*, 2012) argued that it has become imperative to better understand the social science related questions including the actual affordability, potential space tourists' motivations, insurance, health aspects, demand and price on a regional and country-specific basis. Spaceport is not solely about the engineering and technological aspects but also about human beings flying to space for commercial purpose. Therefore, clarity will be needed in relation to developing space journeys long before they actually generate real income to the companies offering them. There are serious academic debates yet to come in this area.

Clearly, these questions need answers and collaborative research with social scientists, aviation engineers, technologists, and astronauts where necessary are needed to fully understand the consumer perspectives and for the future prospectus of this fascinating industry.

Previous research completed by graduate students on Southampton, Bournemouth and Poole in the UK and Mumbai in India indicated that many respondents were aware of the idea of space tourism, regarded space tourism as an important development. However, these works informed that it is also essential to have better campaigns to stimulate the interests of future travellers. Reddy *et al.* (2012) concluded that the intentional need for adventure and exploration seem to be the main motivational force behind space tourism.





Above:  
UK from Space

Left:  
VSS Unity & VMS Eve prepare for another morning of flying on 1 May 2017. During this test, the feather re-entry system was activated in flight for the first time

## The future

Nevertheless, it is time to initiate in-depth academic research to explore the opportunities and challenges facing the short-listed UK locations that will be useful to consumers in the UK and for other parts of the world to benchmark. Regionally, it is important to explore the implications of Brexit on the space tourism industry and to negotiate with the European Space Agency to plan and develop this niche industry in the UK. Internationally, the demand for space tourism is high in fast developing countries such as China and India. In addition, the United Arab Emirates also have plan to make big investments to develop space tourism.

In the long term, commercial space travel is expected to strengthen the development of the concept of point-to-point (P2P) space travel (Peeters, 2010), as travel time could be considerably reduced. For instance, the normal flying time from New York to Tokyo (10,900 kilometres) in a conventional aeroplane is about 12 hours and 50 minutes. Through P2P sub-orbital space travel, New York to Tokyo journey can be completed in just 83 minutes, saving 11 hours and 27 minutes. Peeters predicted that the target market for future P2P travel would be the 'time- poor, cash-rich' people, who are obliged to travel, such as, top executives, board members, sports stars (golf, tennis, formula-1), and celebrities (movie stars, musicians)' (Peters, 2010: 1631). Space tourism is expected to revolutionise the lifestyle, travel patterns and future settlements of humanity though it may presently look simply like the mere opening of space for recreation.

*Space tourism is expected to revolutionise the lifestyle, travel patterns and future settlements of humanity though it may presently look simply like the mere opening of space for recreation*

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## Keywords

Aviation, tourism, future, research, recommendations