

## SPACE TOURISM, THE NEXT BIG THING – OPPORTUNITIES AND CHALLENGES

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*Over the past decade the general perception of space tourism has changed from being considered as "science fiction" to becoming recognised as a lucrative opportunity for the space industry. Space tourism stands for any commercial activity that offers its client direct or indirect experience with space travel. It comprises of various activities ranging from long-term stays in orbital facilities to short-term orbital or suborbital flights, and even parabolic flights in an aircraft helping passengers experience short periods of weightlessness. Flights into outer space by private individuals are finding increased attention in the public. Due to which occasional orbital flights with "space tourists" have taken place. Space tourists who have been taken to the International Space Station (ISS) had to shell out large sums of money for the experience. But now the interest seems to be shifting towards providing "cheaper flights" which are not solely aimed at the ISS but remain "suborbital" so that they are affordable to the masses. Space tourism activities may therefore include the use of an aircraft and/or spacecraft. However, the prospects for both suborbital and orbital private human access to space give rise to some challenging legal and ethical questions and call into question the adequacy of existing international law instruments that are directed towards the regulation of the use and exploration of outer space. This essay focuses on some of the most challenging issues regarding proliferation of space tourism and its possible solutions.*

### INTRODUCTION

*“In a general sense, space is the ultimate frontier-and something we at Virgin have dearly wanted to do is bring space tourism one day to the masses”*

*(Sir Richard Branson, 2004)*

Initially space exploration and the use of space were opportunities exclusively reserved for national governments. However, in the twenty-first century, this statement is no longer

holds true as commercial companies begin to take centre stage in a field that was exclusively reserved for governments. An article written in 1984 states that “The recent development of the United States space shuttle marks a new era in the commercial utilization of outer space. Although the shuttle is currently being operated by the federal government, the new space transportation system will result in greater use of the space by private industries.”<sup>1</sup>

Looking forward, the United States government plans to depend upon contracts with commercial private companies, such as SpaceX and Orbital Sciences, to complete specific missions in space, such as resupplying the International Space Station (ISS). These commercial companies have in effect been stepping into the role government once played and have been doing so successfully thus far. Due to their success, these companies are poised to play a key an integral part in worldwide space exploration and launch capabilities.

In 2001, Russia offered the first opportunity for private individuals to buy a ticket into space. After the collapse of the Soviet Union, seeking funds for its struggling space program and grossly indebted country, the Russian government began selling roundtrip tickets on a Soyuz spacecraft for a brief stay in the ISS.<sup>40</sup> For a price of \$20 million, plus paperwork, and rigorous testing and training, one could take a trip off this world to the ISS. To date, Russia’s program has been relatively successful.<sup>2</sup>

Space tourism is fast becoming the new frontier in the transportation industry. Driven by profit-making motive of private venture capitalists, eventual push to offer customers some direct or indirect experience with space travel is no longer the stuff of comic books or science fiction. There seems to be a valid business proposition for the space tourism industry. Market studies indicate that there are more than one thousand sub-orbital passengers per year and this is capable of generating global market figures topping \$1 billion by the end of this decade.<sup>3</sup>

A leading American company Virgin Galactic has signed up more than 200 prospective space tourism enthusiast out of a potential pool of 30,000. Spaceships to cater to the demand such as XCOR’s suborbital vehicle specifically designed for space tourist flights have been built. The Ansari X-Prize continues to spur competition for new flight modes, and hundreds of tickets have been sold at around \$100,000 apiece.<sup>4</sup> The competition’s rules were simple: to design and successfully launch a craft that could safely carry three adults

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<sup>1</sup> Deem, C.L. (1984) ‘Liability of Private Space Transportation Companies to Their Customers’.

<sup>2</sup> Curtis, A.R. and editor (2004) *Space today online - space tourists*. Available at: <http://www.spacetoday.org/Astronauts/SpaceTourists.html> (Accessed: 7 June 2016).

<sup>3</sup> Futron Corporation (2002) *Space Tourism Market Study: Orbital Space Travel & Destinations with Suborbital Space Travel*. Available at: [http://www.futron.com/upload/wysiwyg/Resources/Reports/Space\\_Tourism\\_Market\\_Study\\_2002.pdf](http://www.futron.com/upload/wysiwyg/Resources/Reports/Space_Tourism_Market_Study_2002.pdf) (Accessed: 27 May 2016).

<sup>4</sup> Knapton, S. (2014) *Space tourists will change the world, says sir Richard Branson’s head of mission*. Available at: <http://www.telegraph.co.uk/news/science/space/11156104/Space-tourists-will-change-the-world-says-Sir-Richard-Bransons-head-of-mission.html> (Accessed: 28 May 2016).

above sixty-two miles, the traditionally recognized boundary between Earth and Space, and return them safely. Then, complete the flight again within two weeks, reusing at least ninety percent of the original craft. The competition's requirements meant that the design had to be safe, largely reusable and cost-effective. If a team completed the challenge, the Foundation promised a \$10 million prize—and the honour of being the Lindbergh of space. The competition was a major success. Twenty-six teams from seven countries entered the race.<sup>5</sup> In order to turn this dream into reality, infrastructure to enable, sustain space tourism have started coming up in various parts of the world. Enabling infrastructure for space tourism has already been installed in New Mexico, Oklahoma, Texas, Wisconsin and Florida. The United Kingdom has recently also unveiled eight potential space ports. The UK has invested \$90 million into development of a revolutionary, hybrid UK spacecraft Skylon.<sup>6</sup> In the Asian front, the United Arab Emirates (UAE) and Singapore have forwarded plans to establish spaceports. The final realisation of affordable and safe commercial private human access to outer space may be as significant to mankind as the Wright brothers' Flyer, Gagarin's first spaceflight and the Saturn V 'Moon rocket' that put Aldrin and Armstrong on the Moon.

In the private space Jeff Bezos, founder and CEO of Amazon.com, created Blue Origin to develop low-cost space passenger vehicles of his own.<sup>131</sup> On his ranch in Van Horn, Texas, Bezos is building a suborbital space launch facility that will test components to create a vertical take-off and landing vehicle within the next seven years. In January 2005, Bezos's company was still in the licensing stage, and working with the FAA to certify its launch site.<sup>7</sup>

Armadillo Aerospace, it took part in X PRIZE but couldn't win, is still determined to be a contender in commercial space travel. Armadillo is researching and developing computer-controlled ethanol rocket vehicles for suborbital tourism flights.<sup>8</sup>

Even more ambitious and challenging, Bigelow Aerospace, owned by Las Vegas businessman Robert Bigelow, is developing an orbiting space hotel. Nearing its testing phase, Bigelow has created a hotel in compact pieces that can be inflated and reassembled in space. The only challenge seems to be getting it high into orbit. Taking from the X PRIZE model, Bigelow is offering a \$50 million award in his America's Space Prize competition. The prize will be awarded to the first independent United States group that develops a five or more crew spacecraft that can make at least two orbits, dock and orbit

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<sup>5</sup> Foundation, X. (2016) *Teams*. Available at:

[http://www.xprize.org/teams/rules\\_and\\_guidelines.php](http://www.xprize.org/teams/rules_and_guidelines.php) (Accessed: 7 June 2016).

<sup>6</sup> "TV-Novosti" Autonomous Nonprofit Organization (2016) *National spaceports for UK 'by 2018,' Scotland dominates locations list*. Available at: <https://www.rt.com/uk/172688-uk-spaceports-scotland-space-tourism/> (Accessed: 28 May 2016).

<sup>7</sup> David, L. and Columnist, S.S.I. (no date) *Blue origin: Rocket plans spotlighted*. Available at: <http://www.space.com/1187-blue-origin-rocket-plans-spotlighted.html> (Accessed: 7 June 2016).

<sup>8</sup> Available at: <http://www.armadilloaerospace.com/n.x/Armadillo/Home> (Accessed: 7 June 2016).

with the space hotel, and is at least eighty percent reusable.<sup>9</sup>Coming to India, ISRO recently launched a prototype of reusable launch vehicle that aims to cut cost of sending people to space by a tenth of the present cost,<sup>10</sup> competing with the likes of SpaceX, Boeing, Blue Origins or anyone else by building a reusable launcher. Without any doubt the prospect of commercial 'space tourism', not only suborbital but also orbital, has begun to generate widespread interest and excitement. It has also encouraged many billions of dollars of investment. Its development represents a quantum leap from the 'early' days of private human access to space, which has largely been restricted to a few very wealthy individuals. In case of Suborbital Spaceflight Suborbital spaceflight, which is what most current offerings will offer, covers flights in which orbital velocities are not achieved. After engine shutdown, 3–6 min of microgravity is achieved, after which the vehicle falls back to Earth and re-enters the atmosphere. They usually attain an altitude of around 100 km, a fact that is also dictated by the relevant scientific principles. Numerous different technologies are under consideration. Some concepts involve a horizontal take-off or 'launch', while others take off vertically. From ground to space, concepts can be Single Stage, Dual Stage, Multiple Stage, with a carrier, from an aircraft, from a balloon, or using rocket propulsion. One of the technology challenges is to get as many kg's in sub- orbit compared to kg's needed for propulsion from space to ground, they can vary from aircraft to parachute, and here, one of the technology challenges is thermal protection during re-entry into the atmosphere.

Whereas in orbital space flight the velocity required to stay in an orbit is called 'orbital velocity' and depends on the altitude of the orbit. In orbital spaceflight, orbital velocity must be ensured for the vehicle to keep flying along the curvature of Earth and not fall back to Earth. For a 200 km circular orbit, the orbital velocity is 28,000 km/h, and it is this extremely high speed which makes orbital space flight technically so complex and therefore expensive. Private orbital space- flight for human clients on a commercial basis is obviously much more expensive, demanding in terms of technology and economics which basically means cost of a ticket than suborbital flight, but this has not prevented enterprises such as Excalibur Almaz and SpaceX from engaging in this business. However, a major area of concern is that the legal architecture for this nascent industry has barely got its foundations in order.<sup>11</sup>

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## PRESENT LEGAL FRAMEWORK AND CHALLENGES

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Developments in space tourism sector are hurtling ahead with breakneck speed whereas the body of space law upon which space tourism must be based upon remains clunky, and is designed by and large to apply only between sovereign states. A rare spirit of international

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<sup>9</sup> Aerospace, B. (2016) *Bigelow aerospace*. Available at: <http://www.bigelowaerospace.com/prize.html> (Accessed: 7 June 2016).

<sup>10</sup> Mukunth, V. (2016) *ISRO's reusable launch vehicle: What happened and what next?* Available at: <http://thewire.in/2016/05/24/isros-reusable-launch-vehicle-what-happened-and-what-next-38312/> (Accessed: 28 May 2016).

<sup>11</sup> Available at: <http://uk.reuters.com/article/scienceNewsMolt> (Accessed: 6 June 2016).

legal and scientific socialism has infused space law since its inception by statesmen, international bureaucrats and enthusiastic scientific advisors who were awe-struck by the rapid achievement and fascinating prospects of space travel. Therefore, space law proceeded very well under brotherly ideals such as the “province of mankind” and the “common heritage of mankind” principles found in the Outer Space Treaty (1967) and Moon Treaty (1979) respectively, Astronauts and space objects have to be returned to their respective states even when they land in hostile/enemy territory under the Astronaut Treaty (1968), space with active space programme on the other hand are liable for cost of repair and compensation for all accidents or damage caused by their objects according to the Space Liability Convention of 1971. In fact, all intricacies appeared settled in the little known world of space lawyers until the advent of space tourism. Which throws up various situations where there is absence of legal framework to counter various challenges being faced by this nascent industry.

Even though there is immense potential for space activities and the number of private participants have expanded significantly since these treaties were finalised, it can be still observed that the non-appropriation principle constitutes ‘an absolute legal barrier in the realization of every kind of space activity’. The amount of capital expenditure required to research, scope, trial, and implement a new space activity is quite significant. To bring this activity to the point where it can represent a viable ‘stand-alone’ commercial venture takes many years and almost limitless funding. From the perspective of a private enterprise contemplating such an activity, this would quite obviously be an important element in its decision to devote resources to this activity that it is able to secure the highest degree of legal rights for the protection of its investment. Security of patent and other intellectual property rights owned by the firms, for example, are vital prerequisites for private enterprise research activity on the ISS. These rights have been specifically addressed by the partners to the project and are applicable to all experiments undertaken on board the ISS.<sup>12</sup>

Several countries have enacted national space legislation, but they have not always addressed ‘space tourism’.<sup>13</sup> Under the outer space treaty, which seeks to regulate outer space activities of humans, article 5 defines “envoys of mankind” and obliges states to provide astronauts with “all possible assistance in the event of accident, distress, or emergency landing on the territory of another State party or on the high seas”. In case an astronaut makes an emergency landing, they must be safely and promptly returned to the state of registry of the space vehicle. In contrast with this qualified duty of states, article V places a broader duty on astronauts by obliging them to provide “all possible assistance to each other” - thus, in any place and under any circumstances. The Rescue Agreement of 1968, which is broadly based upon sentiments of humanity, develops and gives further concrete expression to the rescue provisions in the Outer Space Treaty and specifically deals with the requirement of rendering of assistance to astronauts in the event of an accident, distress

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<sup>12</sup> Article 21 of the ISS Agreement

<sup>13</sup> *Space law: National space law database* (2014) Available at: <http://www.unoosa.org/oosa/en/SpaceLaw/national/index.html> (Accessed: 7 June 2016).

or emergency landing, ensuring prompt and safe return of the astronauts and the return of objects launched into outer space. It should be noted that the title and preamble of the Rescue Agreement refer to "astronauts", while the text of the Agreement employs the broader term "personnel of a spacecraft", which may, according to Yun, include astronauts, space engineers and scientists. However, that the terms "astronaut" and "space personnel" in the Rescue Agreement also include space tourists, since neither of these terms is (formally) defined in any of the outer space treaties, nor in any domestic laws. This uncertainty leads to ambiguity to the question of whether or not states have a duty to rescue space tourists as passengers (as opposed to astronauts and personnel) on a spacecraft. A relevant question could also be if the duty to rescue applies only to state-sponsored missions, or to commercial spaceflights as well.

The Mission Statement of the ISS is predicated on the assumption that it will be permanently inhabited, that is to say, from this point of time onwards, there will always be human beings in outer space<sup>14</sup>. Further evolution of space tourism activities will not only make space more accessible to human beings, but will also ensure constant human presence. It cannot be said to be incompatible with the provisions of the Outer Space Treaty, provided that the rules regulating such activities ensure that the general concepts set out in the international space law treaties are properly protected. In this regard, many questions arise that will influence the way that the international law of outer space should regulate future space tourism activities. For example, what types of space tourism activities should be allowed? Should there be regulations on the nature of these activities to preserve the 'integrity' of outer space? How should these restrictions be determined? How do space tourism activities correlate with the underlying philosophy of international space law — that the exploration and use of outer space 'shall be carried out for the benefit and in the interests of all countries'? Would it be acceptable, for example, to allow advertising billboards to be constructed, or casinos or even brothels to be established on the Moon to cater to space tourists? As the capability of space-related technology advances, these qualitative questions need to be addressed, in order to prioritise those activities that most closely accord with the overall goals associated with humankind's ongoing endeavours in space.

Another challenge is of liability, unlike air law, which has precise and tested rules on passenger, operator and third-party liability, the outer space legal rules relating to liability are state-orientated and have not yet been interpreted by the courts. Article VI of the outer space treaty states that "States Parties to the Treaty shall bear international responsibility for national activities in space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty." It furthermore states that, the activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorisation and continuing supervision by the appropriate State Party to the Treaty. Which basically

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<sup>14</sup> Article 1 of the ISS Agreement

means that states hold responsibility for their own space activities, as well as for the activities carried out by non-governmental entities that launch space objects from their territories. In addition, the activities of non-governmental entities must be authorised and continuously supervised by the relevant state. There is however lack of clarity on the meaning of terms such as "national activities" and "appropriate state party" in the context of space tourism, it is not clear how states will implement their obligations under article VI in a uniform manner. Some states, for example South Africa, authorise private space activities by means of a statutory licensing system.<sup>15</sup> In contrast, other states do not explicitly provide for a licensing system in their domestic space legislation and even a major space power, France, has for many years functioned well without such a system.

A potential area of big concern, is ozone depletion accompanied by increasing presence of black carbon which will arise due to increasing frequency of rocket launches in order to cater to the ever increasing demand for space travel. A large increase in the number of rocket launches per year would lead to alteration of temperatures at both the tropics and at the poles, causing significant sea ice loss in the polar regions. The atmosphere is sensitive to rocket emissions generally, and is particularly sensitive to black carbon emitted by the industry's hybrid rockets, as black carbon can remain trapped in the stratosphere for years. The researchers predict that 1,000 rocket launches per year would reduce ozone by 1.7% in tropical areas while increasing it five to seven percent in the polar regions. This would lower tropical temperatures by 0.4 °C and raise polar temperatures by as much as 1 °C, reducing polar sea ice by five to fifteen percent in thirty years. A suborbital rocket fleet launched 1,000 times per year would influence global climate about as much as the entire world's fleet of subsonic aircraft, leading the researchers to conclude that "rocket emissions on this scale clearly cross a threshold to be considered a human-influenced climate impact of global importance."<sup>16</sup> It is highly probable that 1,000 rocket launches per year is a conservative estimate; XCOR Aerospace plans to offer four flights a day. If it is successful, one company alone will launch 1,460 annual rocket flights.<sup>17</sup>

There are no specific mechanisms to adequately regulate space debris. Little has been done to strengthen the legal requirements relating to the environmental protection of outer space, mainly due to the significant costs associated with 'clean' space technology and practice. Nevertheless, progress has recently been made with an agreement on debris mitigation guidelines endorsed by the UN General Assembly in 2007 and the Inter-Agency Debris Coordination Committee ('IADC') guidelines a few years earlier. Space tourism activities will inevitably result in greater pressures on the environment of Earth. There are claims that space tourist vehicles will one day become the world's primary source of carbon

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<sup>15</sup> Available at: [http://www.saflii.org/za/legis/num\\_act/saa1993113/](http://www.saflii.org/za/legis/num_act/saa1993113/) (Accessed: 5 June 2016).

<sup>16</sup> Ross, M., Mills, M. and Toohey, D. (2010) *Potential Climate Impact of Black Carbon Emitted by Rockets*. Available at: <http://sciences.blogs.liberation.fr/files/tourisme-spatial-et-climat.pdf> (Accessed: 5 June 2016).

<sup>17</sup> Pasztor, A. (2011) *Virgin galactic's flights seen delayed yet again*. Available at: <http://www.wsj.com/articles/SB10001424052970204777904576653690338241146> (Accessed: 5 June 2016).

dioxide emissions — as well as of outer space.<sup>18</sup> They will lead to the pollution of previously pristine areas. The regulation of human activities like littering would cost relatively little in dollar terms. It is imperative that this is done to minimise the impact on the space environment.<sup>19</sup>

It is also crucial to consider the importance of sites in outer space that are historically significant and will remain so. Legal mechanism will be required to ensure safety for 'heritage sites' in order to protect particular sites from accidental or deliberate damage by space tourists, for example the site of the first lunar landing by humans<sup>20</sup>. Similar concerns need to be applied to other space activities that cause harm to outer space and celestial bodies, such as the deliberate crashes into the Moon's surface that formed the basis of the LCROSS experiment referred to above. These are, difficult questions and will not arise in the near future, but it represents important elements in the overall planning of an appropriate international legal regime for human activities in outer space, including space tourism. It will be important to develop comprehensive and universal ethical standards and practices to deal with the continued utilisation of space in this way. It will be extremely important to develop comprehensive and universal ethical standards and practices to deal with the continued exploitation of outer space.

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## THE WAY AHEAD

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It can be observed that neither space law nor current environmental law is sufficient to address the environmental problems being spread by this growing industry. Current space law is a patchwork of international treaties, federal law, and state laws. Very broadly, the international agreements demonstrate that even during the Cold War, the focus of space law has been on assigning responsibility and mitigating harm. The Outer Space Treaty, article VII, for example, makes each state party internationally liable for damages caused by objects launched. However, none of these regimes specifically addresses environmental issues posed by space activity. "Traditional" space law is basically silent on climate change.

It should be clear from the above exposition that the current space treaties are to a large extent outdated and that they cannot adequately deal with the unique legal challenges presented by the rapidly developing space tourism industry. This is furthermore exacerbated by the fact that the outer space legal framework is very fragmented - consisting of treaties, UN principles and guidelines, regional regulations and intergovernmental agreements, as well as national guidelines and legislation. The current space law regime is not able to bear the ever evolving space tourism industry as 'the backbone of international space law is too inflexible to be a stable basis for space tourism'.<sup>21</sup>

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<sup>18</sup> International Co-operation on the Peaceful Uses of Outer Space, GA Res 62/217, 62nd sess, 79th plen mtg, UN GAOR, UN Doc A/RES/62/217 (22 December 2007).

<sup>19</sup> Available at: [http://www.unoosa.org/documents/pdf/spacelaw/sd/IADC-2002-01-IADC-Space\\_Debris-Guidelines-Revision1.pdf](http://www.unoosa.org/documents/pdf/spacelaw/sd/IADC-2002-01-IADC-Space_Debris-Guidelines-Revision1.pdf) (Accessed: 6 June 2016).

<sup>20</sup> Article 7(3) of the Moon Agreement

<sup>21</sup> Bederman, D.J. *The Spirit of International Law*. 2002: University of Georgia Press.



One potential solution could be to draft a new international treaty on space utilisation in the post-Cold War world that includes provisions which aims to address climate change from private space craft. International space law remains "anchored down by Cold War philosophies." It makes states responsible for all space-bound activity within their borders and provides for relief of injuries caused by others in space exploration, but it lacks a comprehensive plan to commercially utilise space or to address the externalities involved in utilisation. Given the growing potential-if not imminent necessity-of private spaceflight, a brand new international space treaty could be in order.<sup>22</sup> Such a treaty could promote the development of cleaner, more environmentally-friendly private spacecraft, could set up an international cap-and-trade permitting program for private space launches, or could even establish a regulatory body to recommend emissions standards for private launch vehicles. However, this would not be a simple step as the international community often has difficulty reaching consensus on environmental regulation. Which has been observed in every climate change conference where there bickering among different stakeholders.

Another solution to wade through the legal quagmire could be to unify air and space law into one, overarching, aerospace law, and place space tourism under the jurisdiction of International Civil Aviation Organization (ICAO). ICAO has long been an international forum which is capable of providing technical services and management, and has the potential to create traffic safety, security, and environmental rules for launch vehicles<sup>23</sup>. Air law and space law share inherently common values: the recognized desire to develop these arenas for the benefit of all humanity, as well as a belief in state equality and sovereignty. Adding space tourism to ICAO's aegis would most likely help. ICAO is already engaged in studying and exploring ways to reduce aircraft emissions.<sup>24</sup> In fighting climate change, ICAO has agreed to a global two percent annual improvement in fuel efficiency until 2050, and to work towards carbon-neutral growth. This technical focus and long-term vision could help address and mitigate climate change caused by space tourism in a proactive, effective way.

Finally, if we consider long-term out of the box potential technological solutions to rocket emissions, which may sound far-fetched, should not be dismissed out-of-hand. Although still science-fiction today, space elevators<sup>25</sup> and mass drivers have the potential to minimize or even eliminate rocket emissions while maintaining the ability to deliver things into orbit. Any proper solution to the threat of climate change from space launches should promote the development of technology that can ease the need for rocket launches

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<sup>22</sup> Available at: [http://www.nasa.gov/pdf/384767main\\_SUMMARY%20REPORT%20-%20FINAL.pdf](http://www.nasa.gov/pdf/384767main_SUMMARY%20REPORT%20-%20FINAL.pdf) (Accessed: 6 June 2016).

<sup>23</sup> Abeyratne, R. (2004) 'ICAO's Involvement in Outer Space Affairs-A Need for Closer Scrutiny?'.  
*Journal of Space Law and Policy*, 34(1), 1-12.

<sup>24</sup> *Home* (2013) Available at: <http://www.icao.int/icao/en/Env2010/Aee.htm> (Accessed: 6 June 2016).

<sup>25</sup> Shiga, David (2009) 'Space elevator' wins \$900,000 NASA prize. Available at: <http://www.newscientist.com/article/dn18122-space-elevator-wins-900000-nasa-prize.html> (Accessed: 6 June 2016).

generally.<sup>26</sup>The core of existing international space law represents an important base in order to develop the legal framework to properly regulate the next level of space activities. However, it is not sufficient even for present requirements, let alone for the imminent future. With the advent of space tourism many unanswered legal questions arise, some of which have been highlighted. Other legal implications will also arise. As more space tourism, exploratory activities take place, appropriate dispute resolution procedures must be agreed upon in order to come to a consensus to deal with conflicts that will inevitably arise, both at the public and private international law level. Detailed and specific traffic management systems must be developed. Moreover, an all-inclusive legal framework must be established at the international level to reflect the wishes of the wider global community and provide certainty as the decisions undertaken will be consensual. At the same time, we have to keep in mind, the broader philosophical and ethical aspects of human activities in outer space - indeed the place of human beings in the universe - demand that we continually reassess the 'why' and 'what' in relation to our ongoing exploration and use of outer space. Moreover, just as the exploration and use of outer space is impacted by earthly concerns - which may include economics, politics, social and fundamental human rights - it also serves as a model for our future activities on Earth. There are many lessons that we can learn from our exploitation or over-exploitation of the Earth's natural resources. Should we adopt this 'exploitative' approach to the utilisation of the resources of outer space, doing it as quickly as we can, irrespective of the longer-term consequences which can turn out be very serious? Or, rather, should our future activities in outer space and eventually on Earth - be more considered and measured, taking into account the varying expectations and capabilities of the various countries on Earth? In order to ensure that space tourism is indeed to the benefit for all mankind, it is important to ensure that precise international legal rules relating to space tourism are formulated, where standards are set for the supervision and authorisation of these exercise's, and the interests of different stakeholders the states, passengers and private actors are balanced as far as possible.

All of these issues represent considerable challenges as to how international law, incorporating the international legal regulation of outer space, will be able to cope with future activities in space, including the advent of commercial space tourism. The way in which the law is developed and adapted to meet these challenges will be important not only for outer space itself, but also for future generations living on Earth. Outer space belongs to all of us on earth. Its utilisation should reflect underlying notions of cooperation and shared benefit, which must remain as the cornerstones in this next phase of human achievement. International law has a crucial part to play in this regard.

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<sup>26</sup> shiga, david (2006) *Huge 'launch ring' to fling satellites into orbit*. Available at: <http://www.newscientist.com/article/dn10180> (Accessed: 6 June 2016).