

THE MISSION (IM)POSSIBLE: TOWARDS A COMPREHENSIVE LEGAL FRAMEWORK REGULATING SAFETY ISSUES OF POINT TO POINT SUBORBITAL FLIGHTS¹

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Introduction

Space tourism and the legal issues associated with suborbital flights have been discussed scholarly for a long period of time². There is, however, very few articles about the discussion regarding the phenomenon of expanding suborbital flights to

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- 2 Bensoussan, D. Space Tourism Risks: A Space Insurance Perspective. *Acta Astronautica*. 2010, 66(11-12): 1633-1638; Hobe, S. Legal Aspects of Space Tourism. *Nebraska Law Review*. 2007, 86(2): 439-458; Hobe, S.; Goh, G. M., and Neumann, J. Space Tourism Activities – Emerging Challenges to Air and Space Law. *Journal of Space Law*. 2007, 33(2): 359-373; Collins, P. Space Tourism: From Earth Orbit to the Moon. *Advances in Space Research*. 2006, 37(1): 116-122; Walker, M. Suborbital Space Tourism Flights: An Overview of Some Regulatory Issues at the Interface of Air and Space Law. *Journal of Space Law*. 2007, 33: 375-404.

international point-to-point suborbital flights (P2P)³. The main rationale for this article is to identify the very real safety threats of P2P flights, which are evolving in the absence of legal safeguards. Chapter one will discuss the internationalization of suborbital flights, the associated safety concerns, the impact of politics on international space law, and the never-ending discussion of establishing a demarcation line – a “border” between outer space and the planet’s air zone. Chapter two will enumerate and explore four selected safety treats to P2P flights: 1) the lack of definition of the “space passenger”; 2) the lack of unification in spaceport standards around the world; 3) the growing amount of space debris; and 4) the weaponization of outer space. The first two threats will be analyzed by using US legal regulations and the possible adaptation of those regulations to an international document. The latter two threats explicitly call for international cooperation, as the amount of space debris and the weaponization of outer space significantly jeopardize the safety of an aerospace vehicle, its crew and “passengers”. Chapter three analyzes four international space law conventions and the suitability of their usage to safeguarding the safety of commercial P2P flights. Chapter four presents the fictitious scenario concerning an international suborbital vehicle, which crashed as a result of pilot error. The aim of this example is to show, in more practical terms, how troublesome liability issues can be for safety failures that occur during the flight under both air and space liability regimes, respectively. Finally, conclusions indicate that the safety threats of P2P flights ought to be regulated in a binding (hard law) form, and that this should be the goal of the international community. However, in the absence of an international binding document, and due to the long process of its creation, a non-binding document (soft law) should be a temporary tool, unless that document can be ratified, signed or acceded to later.

1. The internationalization of commercial suborbital space flights and safety issues

A point to point suborbital flight can be defined as a flight which “involves the launch of an object or objects into outer space without that object or such objects completing one or more orbits around the earth”⁴. In the view of the author, the definition can be explored by defining P2P flights as a special category of flights above the surface of the Earth (an altitude between 100 and 200 kilometers⁵), performed by the

3 Peeters, W. A Roadmap for Suborbital Commercial Passenger Spaceflight. *NEW SPACE*. 2013, (1): 81–90.

4 Van Fenema, P. Suborbital Flights and ICAO. *Air Space Law*. 2005, 30(6): 396–411, p. 396.

5 *Suborbital Info: The World Is Big. Especially From Above*. 2014 [interactive]. [accessed on 2014-10-25]. <http://www.space-affairs.com/index.php?wohin=suborbital_info&subon=5>.

suborbital vehicle below the orbital velocity⁶ where the place of departure (point one) and the place of destination (point two) are situated in at least two jurisdictions. Virgin Galactic is the first private commercial suborbital spacecraft operator to sign an agreement with the Federal Aviation Administration (FAA) for clearance to take off from Spaceport America in New Mexico on the 29 of May, 2014⁷. According to NASA's report, this specific commercial space activity "will be an important part of the future global economy"⁸, however, at the current time, it is only affordable to the few due to high cost of a ticket which varies between \$95 000⁹ to \$250 000¹⁰. The ultimate goal of space travel is to use it as a new mode of transportation. Origins and destinations (points one and two) will be spread across many jurisdictions. Thanks to this, a flight from Sydney to London will last approximately four hours¹¹. Consequently, a large amount of time will be saved, which will be very beneficial for international business travelers. They will probably be the biggest user of this mode of transportation despite the high costs associated with P2P flights¹². The more mature the P2P flights' market becomes, the more affordable the trip would be, which eventually can lead to popularization of the P2P mode of transportation. The market behavior and ticket price can act in a similar pattern to the aviation industry – at the beginning of the era of international civil aviation¹³, flying was perceived as luxury available to few; nowadays, tickets have become affordable so that everyone can fly. In addition, The Space Transportation Annex estimates that there will be three stages

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- 6 *Suborbital vs Orbital*. 2014 [interactive]. [accessed on 2014-10-25]. <<http://www.orb.space.com/Background-Information/Suborbital-vs-Orbital.html>>.
 - 7 *Virgin Galactic Is Getting Cleared For Takeoff From Spaceport America*. 2014 [interactive]. [accessed on 2014-10-25]. <<http://www.forbes.com/sites/alexknapp/2014/05/31/virgin-galactic-is-getting-cleared-for-takeoff-from-spaceport-america/>>.
 - 8 Thompson, A. D., and Smith, G. P. *Space Policy Development via Macro-Economic Analysis*. 2009 [interactive]. [accessed on 2014-10-25]. <http://www.nasa.gov/pdf/368983main_Applying%20a%20Macro-Economic%20Analysis%20to%20Space%20Policy%202009_06_09.pdf>, p. 9.
 - 9 Atkinson, N. *Fare Alert! Price Drops for XCOR's Ticket to Space*. 2014 [interactive]. [accessed on 2014-10-25]. <<http://www.universetoday.com/21775/fare-alert-price-drops-for-xcors-ticket-to-space/>>.
 - 10 *Virgin Galactic*. 2014 [interactive]. [accessed on 2014-10-25]. <<http://www.virgingalactic.com/booking>>.
 - 11 Walton, J. *Virgin Galactic's Suborbital Shuttle: Sydney to London in 4 hours*. 2014 [interactive]. [accessed on 2014-10-25]. <http://www.ausbt.com.au/virgin-galactic-suborbital-shuttle-sydney-london-4-hours?utm_source=facebook&utm_medium=social&utm_campaign=facebook>.
 - 12 Gismatullin, E. *Wealthy Investors May Use Suborbital Flights to Reach Property*. 2014 [interactive]. [accessed on 2014-10-25]. <<http://www.bloomberg.com/news/2014-03-01/wealthy-investors-may-use-suborbital-flights-to-reach-property.html>>.
 - 13 MacKenzie, D. *ICAO: A History of the International Civil Aviation Organization*. Toronto: University of Toronto Press, 2010.

in the development of Future Space Transportation Systems and the last being “mass public space transportation”¹⁴.

At present, there is no international law regulating any aspect of suborbital flights, nor is there an organization which would be in charge of controlling them¹⁵. The safety threats associated with suborbital flights are growing, and if they remain unresolved, it can jeopardize the health and life of space tourists, as well as safety of the flight. The prime challenge is regulating the P2P flights at an international level in this atmosphere of political unwillingness to create and obey international laws¹⁶. The main purpose of any international legal regulation is to be implemented and enforced internationally after the signing, ratifying or acceding of it. International space law is affected by international politics, where states favor their national interests, disturbing the process of international co-operation and consensus. One example of this is the lack of the demarcation line between the air zone and outer space¹⁷; this is not because it is technologically impossible to do so, but because it is politically unfavorable¹⁸. Despite the proximity of air zone and outer space, the legal regimes are totally different. Article 1 of the Chicago Convention 1944¹⁹ proclaims the sovereignty of air zone over state territory. This is unlike the boundless freedom of outer space which belongs to no nation, as stated in Art.1 of the Outer Space Treaty 1967²⁰. The US treats the suborbital vehicle like a spacecraft, while the European Space Agency prefers the vehicle to be classified as an aircraft²¹.

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- 14 Federal Aviation Administration. *Space Transportation Concept of Operations Annex for NextGen 1.0*. 2008 [interactive]. [accessed on 2014-10-25]. <https://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/library/media/Space_Transportation_Concept_of_Operations_Annex_for_NextGen.pdf>, p. 15–16.
- 15 Freeland, S. Up, up and ... Back: The Emergence of Space Tourism and Its Impact on the International Law of Outer Space. *Chicago Journal of International Law*. 2005, 6(1): 1–22; Ryabinkin, C.T. Let There Be Flight: It’s Time to Reform the Regulation of Commercial Space Travel. *Journal of Air Law and Commerce*. 2004, 69(1): 101–137.
- 16 Brown, B. S. *The United States and the Politicization of the World Bank: Issues of International Law and Policy*. London and New York: Kegan Paul International, 1992; Kennedy, D. The Forgotten Politics of International Governance. *European Human Rights Law Review*. 2001, (2): 117–125; Niemyer, G.. *Law without Force: The Function of Politics in International Law*. New Brunswick, New Jersey: Transaction Publishers, 2001.
- 17 Rosenfield, S. B. Where Air Space Ends and Outer Space Begins. *Journal of Space Law*. 1979, 7(2): 137–148, p.137.
- 18 Qizhi, H. The Problem of Definition and Delimitation of Outer Space. *Journal of Space Law*. 1982, (10): 157–163, p. 162.
- 19 Convention on International Civil Aviation 15 UNTS 295, 61 US Stat 1180, entered into force April 4, 1947.
- 20 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 610 U.N.T.S. 205, entered into force October 10, 1967.
- 21 Masson-Zwaan, T. Regulation of Sub-orbital Space Tourism in Europe: A Role for EU/EASA? *Air Space Law*. 2010, 35(3): 263–272.

As noted, international law requires clarity, thus, definitions should be as clear as possible in order to create a “normative order of good quality”²². The current imprecise definitions, or the absence of them, pose a threat to the safety of P2P flights. The private commercial space sector is unique compared to a typical “on Earth” business because liability for any damage caused in outer space or “on Earth” is the responsibility of the launching state and not the private launch operator. It does not matter whether the fault was on the operator’s side, the current international binding regime does not recognize non-State actors as liable parties. Thus, it is in the best interests of all the states that explore outer space to create or amend the current international space law framework to comply with 21st century developments. However, transferring the blame from the state party to the non-state party will not completely resolve the safety issues surrounding P2P flights. For the international community to assume joint liability, a comprehensive legal framework regulating safety, definitions, and standards of safety must be established.

2. The most crucial threats concerning safety of P2P flights

The following safety issues of P2P flights ought to be regulated within the international comprehensive legal framework, in particular developing a proper definition of the term space participant, unifying spaceport safety standards, mitigating space debris and banning placing weapons in outer space. Safety issues of P2P flights should be treated by international community in the same ways as radio frequencies and orbital slots are perceived²³. Every country that is taking part in the telecommunication business should be subject to the standards and procedures of the International Telecommunication Union (ITU)²⁴.

The US, which has the most experience with a functioning legal regime regulating a private commercial space sector²⁵, has begun legally regulating the commercialisation of space activities with the Commercial Space Act 1984²⁶. The Act is concerned with commercial activities in space performed by the private sector,

22 Weil, P. Towards Relative Normativity in International Law? *American Journal of International Law*. 1983, (77): 413-442, p. 413.

23 Jakhu, R. S. Regulatory Process for Communications Satellite Frequency Allocations, in *Handbook of Satellite Applications*. New York: Springer, 2013, p. 271–292; Allison, A. L. *The ITU and Managing Satellite Orbital and Spectrum Resources in the 21st Century*. Switzerland: Springer International Publishing, 2014.

24 McGuire, S., and Hansson, A. Regulating Commercial Space: Is the WTO the Answer? *Space Policy*. 2000, 16(1): 7–11, p. 8.

25 Blasingame, M. Nurturing the United States Commercial Space Industry in an International World: Conflicting State, Federal, and International Law. *Mississippi Law Journal*. 2010, 80(2): 741–788, p. 741.

26 Commercial Space Launch Act, Pub. L. No. 98-575, 98 Stat. 3055 (1984) (codified at 49 U.S.C. §§ 2601-2623 (1984)).

although suborbital space flights were not subject to the 1984 Act²⁷. In 1988, an amendment to the Act²⁸ provided provisions concerning insurance coverage and third party liability for damages²⁹. Also in 1998, the Act was again expanded to include re-entry vehicles and re-entry sites used by non-governmental entities. In 2000, the FAA established the spaceport's licensing standard for re-launching vehicles, such as Spaceship Two. The last amendment, The Commercial Space Launch Amendment Act of 2004 (CSLAA)³⁰, granted the FAA the mandate to oversee commercial space activities and established definitions of sub-orbital rocket³¹, sub-orbital trajectory³² and space flight participant³³. What can be observed is a gradual elaboration of standards and definitions in line with the requirements of the industry at the specific time. The international community can save time, effort and money by drafting one, comprehensive legal document.

2.1. Space “passengers”

The CSLAA does not use the word “passenger” for those tourists who are travelling on a suborbital flight. Even if for the purpose of the Act, it is clear that space participant equals space passenger, it raises some ambiguity at the international level. For example, only the passenger or the passenger's relative(s) can bring a death or injury claim under Art. 17 of the Montreal Convention of 1999³⁴. The term “space participant” would be unrecognised under that regime, thus, no damages would be allowed. Another ambiguity is raised by the concept of “informed consent” that is used in legislation of some states, such as New Mexico or California, which immunizes the operator from any liability associated with the suborbital flight. The concept of informed consent³⁵ is substantially used in the medical sector. The most

27 Pelton, J. N., and Jakhu, R. *Space Safety Regulations and Standards*. United Kingdom: Elsevier Ltd., 2010, p. 150.

28 The Commercial Space Launch Act Amendments of 1988 (CSLAA).

29 Pelton, J. N., and Jakhu, R., *supra* note 22, p. 162.

30 Commercial Space Launch Amendment Act of 2004. Public Law 108-492, 118 Stat 3874. December 23, 2004.

31 (49 U.S.C. § 70102 (19)(2004): “suborbital rocket’ means a vehicle, rocket-propelled in whole or in part, intended for flight on a suborbital trajectory, and the thrust of which is greater than its lift for the majority of the rocket-powered portion of its ascent”.

32 (49 U.S.C. § 70102 (20)(2004): “suborbital trajectory’ means the intentional flight path of a launch vehicle, reentry vehicle, or any portion thereof, whose vacuum instantaneous impact point does not leave the surface of the Earth”.

33 (49 U.S.C. § 70102 (17)(2004): “space flight participant’ means an individual, who is not crew, carried within a launch vehicle or reentry vehicle”.

34 Convention for the Unification of Certain Rules for International Carriage by Air, 28 May 1999, ICAO Doc 9740, entered into force November 4, 2003.

35 Corti, L., *et al.* Confidentiality and Informed Consent: Issues for Consideration in the

common example is the consent form in the hospital which the family of the patient whose life is in danger has to sign in order for doctors to perform surgery. However, only the inherent risk connected to the surgery is covered by the informed consent. Also, the applicability of “informed consent” to suborbital flights is quite unique compared to “informed consent” in the medical sector. In the case of the former, even negligence of the space operator’s employees will be covered by the “informed consent”³⁶. The negligence on a doctor’s side is not³⁷. On the other hand, the wording of the informed consent provision in the California Civil Code provides an absolute disclaimer of liability of the space operator by stating “I understand and acknowledge that I am participating in spaceflight activities at my own risk”³⁸. The FAA study on informed consent shows that both national regulation and European legislation dealing with contracts distinguish between business-to-business contracts where courts are reluctant to interfere because of the freedom of the party and assumed equal bargaining power. However, contracts dealing with customers or employment contracts are treated separately. The simple reason for this is that customers and employees are perceived as the weaker party. This is inevitably true as customer and employee have no or little room for discussion the clauses of the agreement. The business parties, on the other hand, have financial and legal resources to draw a contract from scratch. There is a mistaken perception about the sort of passengers who are willing to go, at the current time, into sub-orbit within the jurisdiction of one country. They are perceived as risky adventurers who seek adrenaline; thus, the more dangerous the exercise could be, the better for them. If this belief can be kept at a national level, it is absurd when discussing international P2P flights which will be used for people fast transportation as well as cargo transportation.

Preservation of and Provision of Access to Qualitative Data Archives. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*. 2000, 1(3): 46 paragraphs.

36 Federal Aviation Administration. *Study on Informed Consent for Spaceflight Participants*, APT-CFA-230-0001-02F. 2008 [interactive]. [accessed on 2014-10-25]. <https://www.faa.gov/about/office_org/headquarters_offices/ast/reports_ast/library/media/Informed_Consent_for_Spaceflight_Participants.doc.>, p. 25.

37 *Ibid.*, p. 4.

38 The California Civil Code § 2211(a): “WARNING AND ACKNOWLEDGMENT: I understand and acknowledge that, under California law, there is limited civil liability for bodily injury, including death, emotional injury, or property damage, sustained by a participant as a result of the inherent risks associated with space flight activities provided by a space flight entity. I have given my informed consent to participate in space flight activities after receiving a description of the inherent risks associated with space flight activities, as required by federal law pursuant to Section 50905 of Title 51 of the United States Code and Section 460.45 of Title 14 of the Code of Federal Regulations. The consent that I have given acknowledges that the inherent risks associated with space flight activities include, but are not limited to, risk of bodily injury, including death, emotional injury, and property damage. I understand and acknowledge that I am participating in space flight activities at my own risk. I have been given the opportunity to consult with an attorney before signing this statement.”

Knutson asked very important questions regarding informed consent, namely: “what constitutes a complete or fair warning? What risks do [the space operators] have to warn [the space participants] about? And how far do the warnings have to go?”³⁹. She also points out that in certain extreme sports, such as mountain climbing, the risk is already known⁴⁰. Nevertheless, these adventures cannot be compared to State-based regulatory regimes, such as transportation. An Interdisciplinary Study on Space Tourism in India proves the adverse impact of microgravity on the human body, which includes “space adaptation sickness, muscle atrophy by 20%, loss of blood volume by 22% within two-three days of weightless”⁴¹. Transportation is a necessity in today’s world, but extra-risky adventures are optional. Also, the main issue is not that the sub-orbital flights are risky, but the fact that the weaker party – the space participant and his/her family – is deprived of any claims for damages if an accident occurs.

It is worth remembering that the internationalisation of the P2P flights will involve “passengers” whose main purpose is to move quickly from one place to another, rather than participating in a novel sort of extreme sport. Thus, those passengers need to be clearly defined in legal terms by any international document that is developed.

2.2. Spaceports standards

Spaceports’ safety is the core to the overall safety of P2P flights. If spaceport is not up to the highest safety and risk mitigation standards, then even the best legal definition of passengers or the overall condition of the vehicle will be insufficient. The estimation of risk plays a key role in obtaining the experimental license for suborbital flight. The FAA has stated that “the potential hazards reduce the associated risk to an acceptable level”⁴². The European Commission Enterprise and the Industry Directorate-General have criticized the FAA’s licensing approach, which they say

39 Knutson, T. What Is Informed Consent for Space-Flight Participants in the Soon-to-Launch Space Tourism Industry. *Journal of Space Law*. 2007, 33(1): 105–110, p. 106.

40 *Ibid.*, p. 117.

41 Jakhu, R. *Space Tourism in India*. Dehra Dun, India: University of Petroleum and Energy Studies (UPES), 2011, p. 23–25; Report of the International Academy for Astronautics (IAA) Study Group. *Medical Safety Consideration for Passengers on Short-Duration Commercial Orbital Space Flights*. 2009 [interactive]. [accessed on 2014-10-25]. <<http://iaaweb.org/iaa/Studies/sg26finalreport.pdf>>; Grenon, S.M., et al. Can I Take a Space Flight? Considerations for Doctors. *British Medical Journal*. 2012, (345): 42–46.

42 Federal Aviation Administration. *Final Environmental Assessment for the Launch and Reentry of SpaceShipTwo Reusable Suborbital Rockets at the Mojave Air and Space Port*, HQ-121575. 2012 [interactive]. [accessed on 2014-10-25]. <http://www.faa.gov/about/office_org/headquarters_offices/ast/media/20120502_Mojave_SS2_Final_EAandFONSI.pdf>, p. 36.

treats suborbital flight as a spacecraft and thus disclaims the private commercial space operator of liability. This situation leads to a low perception of safety concerns and different safety levels⁴³. By providing a total disclaimer of liability to the operator's, it does not encourage an increase in safety standards and furnishes an explicit message that “unless there is no accident, everything is fine.” If the “aviation-like” certification is used instead, then both the manufacturer of the suborbital vehicle, the operator, and the certification authority would be liable. This may result in higher safety standards as liability is imposed⁴⁴.

Dr. Quinn, from the *International Association for the Advancement of Space Safety (IAASS)*, presented the research findings of the Suborbital Safety Technical Committee's Proposed Standards & Guidelines, in which he claimed that there is “no international quantitative safety target for suborbital flights to assure airworthiness/space worthiness”⁴⁵. He also cited the *Spaceport Safety Management System*, which goes beyond the FAA health and safety requirements needed for the Environmental Assessment⁴⁶. The Environmental Assessment in relation to health and safety is based on the federal law standard, which can be seen in the FAA assessment of several spaceports in the US⁴⁷. It should be emphasised that the FAA's standards⁴⁸ are based on the national law of the US. With regard to international regulation, an objective, impartial research regarding spaceport safety ought to be carried out in order to prepare the most optimal standards. The IAASS as a non-governmental organization, having experience in assessing safety standards, should be in charge of such a research.

43 Booz & Company & SpaceTec Partners. Ref. Request for Services under Framework Service Contract No. Entr/2009/050— Lot 1 (Contract No. 30-Ce-036363/00-01) Evaluation Of The European Market Potential for Commercial Spaceflight, Ref. Ares(2013)617034 - 09/04/2013 Prepared for the European Commission Enterprise and Industry Directorate-General. 2013 [interactive]. [accessed on 2014-10-25]. <http://ec.europa.eu/enterprise/policies/space/files/policy/commercial-suborbital-flights-final-report_en.pdf>.

44 *Ibid.*

45 Quinn, A., et al. IAASS Suborbital Safety Technical Committee – Summary of Proposed Standards & Guidelines, Session 27 Commercial Human Spaceflight Safety – Part III. 2013 [interactive]. [accessed on 2014-10-25]. <http://iaassconference2013.space-safety.org/wpcontent/uploads/sites/26/2013/06/1620_Quinn.pdf>, slide no. 10.

46 *Ibid.*, slide no. 14.

47 Federal Aviation Administration. *Final Programmatic Environmental Impact Statement for Streamlining the Processing of Experimental Permit Applications*, HQ-09938. 2009 [interactive]. [accessed on 2014-10-25]. <http://www.faa.gov/about/office_org/headquarters_offices/ast/media/20090803_epepis.pdf>.

48 Federal Aviation Administration, Office of Commercial Space Transportation. *Safety Approval Guide for Applicants*. 2012, version 1.1 [interactive]. [accessed on 2014-10-25]. <https://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/safety_approvals/media/Safety_Approval_Guide_1.1.pdf>.

2.3. Space debris

After the creation of a clear definition for space participant, and an appropriate level of safety determined for the spaceport, it is important to minimise risks associated with the aerospace vehicle after taking off and before landing. Two threats which can impede the safety of P2P flights are space debris and placing weapons in outer space, known as weaponization. In relation to the former, the benefits that result from exploration of outer space will cause increased interest from both space powers and space faring nations⁴⁹. Kessler and Cour-Palais estimate that the main problem in a LEO orbit will be small space debris which may collide with each other and generate more space junk⁵⁰. According to the European Space Agency, the growing numbers of space debris will negatively affect precious space assets⁵¹. The U.S. Space Surveillance Network confirmed in 2012 that there are approximately 23,000 orbiting objects the size of several centimeters⁵². Currently, researchers from Australia are working on a project, which ultimate goal is to use a laser that will destroy the orbital debris. Eventually, time will tell how effective this experiment could be, if at all. However, it is a positive step towards reducing space debris⁵³. Explicit examples of the negative outcomes of space debris include the collision of the Russian satellite, Cosmos 2251, with the US satellite, Iridium 33, in 2009⁵⁴ and the recent destruction of a Russian satellite by space debris from the Chinese ASAT test⁵⁵. An additional example would be the damaged exterior layer of a window on the International Space Station⁵⁶. As

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- 49 Berkley, R. Space Law versus Space Utilization: The Inhibition of Private Industry in Outer Space. *Wisconsin International Law Journal*. 1996, (15): 421-435, p. 421.
- 50 Phipps, C. R. A Laser-Optical System to Re-Enter or Lower Low Earth Orbit Space Debris. *Acta Astronautica*. 2014, (93): 418-429, p. 418.
- 51 *Focus on Growing Threat of Space Debris*. 2014 [interactive]. [accessed on 2014-10-25]. <http://www.esa.int/Our_Activities/Operations/Space_Debris/Focus_on_growing_threat_of_space_debris>.
- 52 Tate, K. *Space Junk Explained: How Orbital Debris Threatens Future of Spaceflight (Infographic)*. 2014 [interactive]. [accessed on 2014-10-25]. <<http://www.space.com/23039-space-junk-explained-orbital-debris-infographic.html>>.
- 53 Withnall, A. *Space Debris Orbiting Earth to be Destroyed with Giant Lasers Fired from Australia*. 2014 [interactive]. [accessed on 2014-10-25]. <<http://www.independent.co.uk/news/science/space-debris-orbiting-earth-to-be-targeted-with-giant-lasers-fired-from-australia-9181280.html>>.
- 54 Cohen, A. F. Cosmos 954 and the International Law of Satellite Accidents. *Yale Journal of International Law*. 1984, 10(2): 78-91; Haanappel, P. C. Some Observations on the Crash of Cosmos 954. *Journal of Space Law*. 1978, 6(2): 147-149.
- 55 David, L. *Russian Satellite Hit by Debris from Chinese Anti-Satellite Test*. 2014 [interactive]. [accessed on 2014-10-25]. <<http://www.space.com/20138-russian-satellite-chinese-space-junk.html>>.
- 56 Wall, M. *Space Station's Brush with Space Junk Highlights Growing Threat*. 2014 [interactive]. [accessed on 2014-10-25]. <<http://www.space.com/12107-space-junk-threat-growing-space-station.html>>.

the problem escalates, several studies are being performed by both governmental and non-governmental institutions. The Japan Aerospace Exploration Agency (JAXA) is undertaking studies on a space debris micro-remover satellite⁵⁷, ion beam shepherd spacecraft which can change both the orbit and altitude of space debris without the necessity of docking⁵⁸ or “high-power ground-based laser”⁵⁹. Space debris is a relatively smaller problem from the perspective of international legal regulators as it requires a willingness of states to come together, use proper technologies and begin moving or destroying space debris.

2.4. The weaponization of outer space

The weaponization of outer space is, on the other hand, inherently linked with the national interests of particular states, especially space powers which do not want to give up the arms race. In this pattern, Quinn specifies that the core issues of nations, such as national defense and global economy, act as an obstacle in stopping the arms race⁶⁰. In exemplification, the US 2006 Space Policy Act uses any kind of treat to the US space assets as a justification for the weaponization of space⁶¹. Its wording raises real legal concerns that appear to contradict Art. I of the OST, which makes the outer space “a common heritage of mankind” and obliged the contracting states to use it for peaceful purposes. On the other hand, the issue of weaponization is explicitly addressed in Art. IV, which prohibits the placement of nuclear weapons in outer space. However, it does not directly ban putting other types of weapons, such as dual purposes weapons, ground-based anti-satellite weapons (“ASAT weapons”).

Tannenwald claims that the lack of a comprehensive legal framework for limiting weaponization will result in the creation of intensive military competition in outer space, which may lead to the destabilization of both national and global security⁶². This is in line with what Bruce DeBlois has said that “what is internationally unsettling and even threatening is not the existing space weapons posture, but [...] space weapons policy (or lack thereof)”⁶³. Wolter attempts to enumerate the reasons

57 Nishida, S., *et al.* Space Debris Removal System Using A Small Satellite. *Acta Astronautica*. 2009, 65(1): 95–102, p. 97.

58 Bombardelli, C., and Pelaez, J. Ion Beam Shepherd for Contactless Space Debris Removal. *Journal of Guidance, Control, and Dynamics*. 2011, 34(3): 916–920, p. 916.

59 Monroe, D. K. *Space Debris Removal Using High-Power Ground-Based Laser*. Bellingham, Washington, USA: International Society for Optics and Photonics, 1994.

60 Quinn, A. G. New Age of Space Law: The Outer Space Treaty and the Weaponization of Space. *Minnesota Journal of International Law*. 2008, 17(2): 475–502, p. 477.

61 Quinn, A. G.. New Age of Space Law: The Outer Space Treaty and the Weaponization of Space. *Minnesota Journal of International Law*. 2008, 17(2): 475 – 502, p. 493.

62 Tannenwald, N. Law versus Power on the High Frontier: The Case for a Rule-Based Regime for Outer Space. *Yale Journal of International Law*. 2004, 29(2): 363–422, p. 364.

63 Peoples, C. Assuming the Inevitable? Overcoming the Inevitability of Outer Space Weaponization and Conflict. *Contemporary Security Policy*. 2008, 29(3): 502–520, p. 503.

for the growing weaponization of space, which will explain why even those who claim that this trend has not occurred should have a closer look. Firstly, the weaponization of space is mimicking the history of the use of weapons used in the air, land or sea; and secondly, the countries will wish to protect their space assets⁶⁴. There is also “a powerful belief within many American policy circles that the weaponization of space is unavoidable”⁶⁵. This seems to mirror what Mowthorpe argues that “the issue of missile defense has the most significance for the weaponization”⁶⁶.

The termination of the continued use of weaponization in outer space seems unlikely, especially bearing in mind the budget increase of 57% on spending for the space missile system during the Bush Administration after the terrorism event of 9/11⁶⁷. A possible resolution, however, is to either create a new binding legal document banning placing any kind of weapons in space, which can be used for destruction, or to amend Art. IV of the Outer Space Treaty and add new categories of prohibited weapons. The lack of uniformed, binding standards regulating the issue is not an option, it is a necessity.

3. The international space law conventions and the issue of safety

There are four treaties regulating space activities at international level, which will be relevant in relation to commercial sub-orbital space flight.

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies of 1967, was the first one which established the international framework for outer space activities, which automatically imposes the requirement for the cooperation among states, the core fundamental of international law-making process, according to Judge Manfred Lachs⁶⁸. The Article 1 proclaims that “the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind”. This provision can be used by opponents of regulating the safety of sub-orbital human space flights by claiming that they lack public interest and will be used for mere recreational

64 Wolter, D. *Common Security in Outer Space and International Law*. Geneva, Switzerland: United Nations Publications UNIDIR, 2006, p. 504.

65 *Ibid.*, p. 505.

66 Mowthorpe, M. *The Militarization and Weaponization Of Space*. Lanham, Maryland, U.S.A.: Lexington Books, 2004, p. 218.

67 Bormann, N., and Sheehan, M. *Securing Outer Space: International Relations Theory and the Politics of Space*. United Kingdom: Routledge, 2009, p. 57.

68 Lachs, M. *The Law of Outer Space: An Experience in Contemporary Law-Making*. Leiden: Sijthoff, 1972, p. 27.

purposes of space tourists. Article VI is very significant as it imposes the international responsibility of the State parties for national activities in outer space. Therefore, the responsibility lies in the appropriate state to assure that the activities carried by private companies in relation to suborbital commercial spaceflights are performed according to international law. Article VII, on the other hand, imposes liability of the State that launches or procures to launch for any damage caused by that space object. The distinction between responsibility and liability is only seen in English version of the OST; the other official United Nations' languages used the term responsibility, despite the gentle difference. Professor Bin Cheng defines that “responsibility means the person’s (in this case the State) answerability for compliance with its legal duties and for any breaches thereof while liability denotes the obligation to bear the consequences of the breach of legal duty, in particular to make a reparation for damages”⁶⁹. Therefore, responsibility is a wider term than liability, hence, it is more likely that a state suffering from the damage caused by a space object of another state will bring the claim under Article VI.

The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space of 1968⁷⁰ (the Rescue Agreement) obliges each Contracting Party to provide assistance to astronauts in the events of accident, distress or emergency landing (Article V). Nevertheless, there are two challenges here – no definition of astronaut and personnel of a spacecraft (the OST is not helpful as it does not provide any definition either) and the limitation of help to Contacting States, even on high seas or any place not subject to any jurisdiction (Article IV). Despite the lack of definition, an astronaut is commonly known as a person trained to undertake a space mission, unlike a space participant⁷¹. Professor Lyall added that this person can be a representative/member of “civilian or military governmental space agencies”⁷². As she/he could act as a crew member, there is a blurred difference between the astronauts and personnel, perhaps it can be used interchangeably. Therefore, the space tourists/participants can fall under the umbrella of definition of untrained person not able to command or serve while on board of the spacecraft flying for leisure purposes only and needs a constant supervision and assistance of the personnel. This definition would be expanded to business purposes in the era of P2P flights.

69 Convention on the Registration of Objects Launched into Outer Space 1975 (Registration Convention) 1023 UNTS 15.

70 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space 1968 (Rescue Agreement) (19 UST 7570 / 672 UNTS 119 / 7 ILM 149 (1968).

71 Failat, Y. Space Tourism: A Synopsis in its Legal Challenges. *Irish Law Journal*. 2012, 1(1): 120–151, p. 124.

72 Lyall, F. Who Is an Astronaut? The Inadequacy of Current International Law. *Acta Astronautica*. 2010, 66(11-12): 1613–1617, p. 1614.

The Convention on International Liability for Damage Caused by Space Objects of 1972⁷³ (the Liability Convention) imposes absolute international liability (which is in line of Article VII of the OST) on the launching state (both governmental agency and private company) for any damage caused in outer space. Again, in relation to sub-orbital flights, there is an overwhelming burden on the launching state to compensate for the damage caused even if it is outside of the control of the state, especially that absolute liability does not allow using any forms of defense (i.e., the reasonable man defense).

The Convention on Registration of Launched Objects into Outer Space of 1975⁷⁴ (the Registration Convention), which imposes an obligation on the launching state to register the space object in the appropriate registry (Article II), as well as the UN to keep the international registry (Article III), is based on the information provided by the launching state (Article IV). The launching state is absolutely liable for any damage caused by the space object and thus obliged to pay compensation (i.e., the USSR paid Canada \$ 3 000 000 compensation for disintegration of Cosmos 954 in Canada in 1978).

Regrettably, none of the four international space law treaties regulates space safety. In other words, currently, there is no international regime which covers space safety. There is, on the other hand, the national safety regime. This is, however, insufficient as it creates a lot of uncertainty because the law applicable in the US differs from that in Sweden or Kazakhstan⁷⁵. As far as safety is concerned, both the launching states and other states also could possibly be affected and private entities cannot afford not to have an international regime. The wording of such safety provision can be similar to that of Principles Relevant to the Use of Nuclear Power Sources in Outer Space 1992⁷⁶ (though non-binding), for example, “the use of sub-orbital space flights should be based on a thorough safety assessment, including probabilistic risk analysis for reducing risk of accidents, i.e. crashing of the vehicle with space debris”, included in the Preamble. Also, the *Committee on the Peaceful Uses of Outer Space* (COPUOS) Debris Mitigation Guidelines of 2007⁷⁷ can be useful in creation of safety regulations.

73 Convention on International Liability for Damage Caused by Space Objects (Liability Convention) 961 UNTS 187; 24 UST 2389; 10 ILM 965 (1971).

74 Registration Convention, *supra* note 68.

75 Stein, E. Assimilation of National Laws as a Function of European Integration. *American Journal of International Law*. 1964, (58): 1–40, p. 1.

76 UN Principles Relevant to the Use of Nuclear Power Sources in Outer Space (1992) UN A/RES/47/68.

77 Inter-Agency Space Debris Coordination Committee (IADC) Space Debris Mitigation Guidelines (2002, as revised in 2007).

4. Air or Space law regime for P2P flights?

4.1. The Montreal Convention of 1999

The Montreal Convention of 1999, which amended the Warsaw Convention of 1929⁷⁸, provides a uniform framework for passengers, carriers and cargo⁷⁹. In the light of this article, attention will be focused exclusively on passengers' right to claim compensation for injury and death included in Art. 17. Claims concerning delay, lost baggage, agency and timely notice will be excluded from the analysis. The author will attempt to apply the main provisions of the Montreal Convention to the factual scenario.

Mr. X, an American citizen, bought a ticket from Happy Spaceship Inc. for suborbital flight No HA567 from New York, US to Berlin, Germany (both countries are signatories to the Montreal Convention). Regrettably, the vehicle crashed near to Madrid solely due to the pilot's fault. All the passengers and cabin crew died in the accident. The relatives of Mr. X claimed compensation for death under Art. 17 of the Montreal Convention.

From the facts provided, flight No HA567 fulfilled the first condition to fall under the provisions of the Montreal Convention, namely Art.1, which defines international flight, *inter alia*, as a flight between two States⁸⁰ (here, the US – the place of departure, and Germany – the place of destination). Pursuant to Art. 17 para. 1, “the carrier is liable for damage sustained in case of death or bodily injury of a passenger upon condition only that the accident which caused the death or injury took place on board the aircraft or in the course of any of the operations of embarking or disembarking”⁸¹. As it was proved that the vehicle crash was caused solely, in other words, exclusively, due to the pilot's fault, thus, the “death took place on board of the aircraft”. If Art. 17 is satisfied, then Art. 21 applies. Pursuant to Art. 21 para. 1, “for damages arising under Art. 17 not exceeding 100,000 Special Drawing Rights (hereinafter – SDR) for each passengers, the carrier shall not be liable to exclude or limit its liability”⁸². Art. 21 para. 2 sets out preconditions which have to be fulfilled in order to receive damages exceeding 100, 000 SDR. Here, Happy Spaceship Inc. will have to prove that the accident was not solely due to the negligence of the carrier's

78 Convention for the Unification of Certain Rules Relating to International Carriage by Air, signed at Warsaw on 12 October 1929 (The Warsaw Convention, 1929).

79 McKay, J. Refinement of the Warsaw System: Why the 1999 Montreal Convention Represents the Best Hope for Uniformity. *Western Reserve Journal of International Law*. 2002, 34(1): 3–102.

80 Montreal Convention, *supra* note 33, Article 1.

81 Montreal Convention, *supra* note 33, Article 17.1.

82 *Ibid.*, Article 21.1.

servants (in this case – the pilot), as the investigation proved that if the pilot had not made the fatal mistake, the airplane would not have crashed.

Thus, in this straightforward artificial scenario, the family of Mr. X could be awarded more than 100, 000 SDR. If the facts changed and Mr. X was badly injured in both legs because of the pilot's fault, he would still be able to pursue a claim under Art.17.1. There would be a problem, however, if Mr. X suffered purely a mental injury or mental distress because of the sudden event (for example, a loss of power in the spaceflight's engines, which lasted a couple of seconds). Even if Mr. X could claim that he was reasonably afraid of crashing, he would not be able to claim any damages successfully as compensation for any mental form of suffering during the flight, embarkation or disembarkation is generally excluded⁸³. The main reason lies in the evidence: how it is possible to prove that mental damage occurred exactly during the flight and not before or after? Despite some tensions, especially in recovering from different types of injury as opposed to death which is quite self-evident, the Montreal Convention provides an exclusive remedy thus generally preempting national laws, thus, it is superior to national laws.

The Montreal Convention and its predecessor the Warsaw Convention are widely recognized⁸⁴; thus, the idea of adding international sub-orbital flights, firstly in terms of death or personal injury and later in terms of cargo/baggage delay or lost claims, has a promising future.

4.2. The Liability Convention of 1972

Pursuant to Art. II of the Liability Convention, “the launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft in flight”⁸⁵. Thus, there is a State-to-State compensation system, so the launching State “will pay a just claim”⁸⁶ rather than a carrier-passenger compensation system, as in the case of the Montreal Convention.

83 *Eastern Airlines, Inc. v. Floyd* - 499 U.S. 530 (1991); *Terrafranca v Virgin Atlantic*, 151 F 3d 108 (3 Cir, 1998).

84 Milde, M. Liability in International Carriage by Air: The New Montreal Convention. *Uniform Law Review*. 1999, (4): 835–861; Weingart, P.; Engels, A., and Pansegrau, P. Risks of Communication: Discourses on Climate Change in Science, Politics, and the Mass Media. *Public Understanding of Science*. 2000, 9(3): 261–283; Kastela, S.; Miljak, Z., and Bozicevic, J. Air Carriers Liability for Damages According to the New Montreal Convention. *Promet-Traffic- Traffico*. 2001, 13(1): 55–58; Mendes De Leon, P., and Eyskens, W. The Montreal Convention: Analysis of Some Aspects of the Attempted Modernization and Consolidation of the Warsaw System. *Journal of Air, Law and Commerce*. 2000, 66(3): 1155–1185.

85 Liability Convention 1972, *supra* note 72, Article II.

86 Reis, H. Some Reflections on the Liability Convention for Outer Space. *Journal of Space Law*. 1978, 6(2): 125–128, p. 128.

Article VII⁸⁷ excludes any claim for compensation from the nationals of the launching states or foreigners participating in the operation⁸⁸.

In the scenario of Mr. X, what would be the results of the applicability of the Liability Convention? Firstly, the Happy Spaceflight would not be liable for the crash. Instead, the US – the launching State – would be responsible for its judicial persons. Moreover, the compensation is more than likely to cover the damage caused on Earth near Madrid when the crash occurred. Therefore, the compensation would be paid to the government of Spain. Mr. X being a national of the US is excluded from claiming any compensation under the Liability Convention. Any other non-American citizen would be excluded, as well. Thus, the Liability Convention in the present form is not suitable to be applied to international suborbital flights. It unfairly favors the carriers (the space industry) from being liable and imposes a huge burden on the government which could take all possible measures to prevent the accident from occurring.

Conclusions

Taking everything into consideration, the era of sub-orbital human space flights will begin soon begin and if predictions are correct, by 2050 mass space transportation will occur. Thus, the lack of regimes in respect of human spacecraft safety at international level raises great concerns as safety, as mentioned earlier, cannot be regulated exclusively at domestic level. The ultimate goal of regulation safety should be at least to create a binding legal framework for suborbital flights in a binding form. The ICAO can create additional annex dealing with sub-orbital flights. In addition, the COPUOS might propose comprehensive convention on space law to be one of the works for Legal Sub-Committee. All in all, the basic legal framework set out in the OST goes back to 1967, while space has been rapidly evolving since then. The most radical option is to establish the International Space Transportation Organization (ISTO) to deal only with sub-orbital and orbital transportation and oversee both legal and technical issues from licensing the launches to overseeing safety standards. The ISTO would work together with both Legal and Technical Committee of the COPUOS and the ICAO. Another option could be evolution of soft laws, especially at international level, for example, an international document which would include self-regulation of private companies offering commercial human sub-orbital space flights in the form of setting up minimum safety performance standards beyond which none of the present or future companies would go. This sort of agreement

87 Liability Convention 1972, *supra* note 72, Article VII.

88 Alexander, R. E. Measuring Damages under the Convention on International Liability for Damage Caused by Space Objects. *Journal of Space Law*. 1978, 6(2): 151–160; Christol, C.Q. International Liability for Damage Caused by Space Objects. *American Journal of International Law*. 1980, 74(2): 346–371.

should be publicly disclosed. Despite their non-binding character, they can influence good practices concerning safety issues of sub-orbital flights. This option should be used only as an interim measure, as safety has to be eventually regulated by the comprehensive binding legal framework.

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MISIJA ĮMANOMA / NEĮMANOMA: KURIANT NUOSEKLIĄ MARŠRUTINIŲ SUBORBITINIŲ SKRYDŽIŲ SAUGUMO UŽTIKRINIMO TEISINĘ REGLAMENTACIJĄ

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Anotacija. Straipsnyje analizuojamos keturios pasirinktos maršrutinių suborbitinių skrydžių saugumo grėsmės: keleivio apibrėžimo šiame kontekste nebuvimas, unifikuotų orbitinio uosto saugumo standartų nebuvimas, augantis kosmoso šiukšlių mastas bei ginklavimasis kosmose. Šios grėsmės parodo, kad oro ir kosmoso teisiniai režimai dar nėra pasirengę tinkamai reglamentuoti maršrutinius suborbitinius skrydžius.

Reikšminiai žodžiai: skrydžio saugumo reglamentavimas, maršrutiniai suborbitiniai skrydžiai, kosmoso komercializavimas, kosmoso šiukšlės, ginklavimasis kosmose, kosmoso teisės sutartys, 1999 m. Monrealio konvencija, 1972 m. Atsakomybės konvencija.

THE MISSION (IM)POSSIBLE: TOWARDS A COMPREHENSIVE LEGAL FRAMEWORK REGULATING SAFETY ISSUES OF POINT TO POINT SUBORBITAL FLIGHTS

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Summary. Space tourism is going beyond the borders of people's actual perception on the topic of human mass transportation from one place on the Earth to another, crossing different jurisdictions. A suborbital flight from London to Sydney will last 4 hours instead of taking 23 hours as it lasts today when traveling by airplane. Point to point suborbital flights (P2P flights) offer a new mode of worldwide mass transportation. Consequently, they should be legally regulated at an international level. The article

analyzes selected safety concerns which can create obstacles to the development of a global legal framework regulating the safety of P2P flights. The selected provisions of the US Commercial Space Launch Amendment Act of 2004 are reviewed in order to analyze mistakes and avoid the same mistakes at the international level. The article specifies four main threats to safety which need to be resolved internationally: the lack of a definition for the term space passenger, the lack of unified spaceport safety standards, the growing amount of space debris and weaponization of outer space. Main international space treaties are analyzed as to their suitability for P2P flights. The fictional scenario provided in the article involves a claim for damages for death as a result of vehicle crash due to pilot error, which is used as an illustration of the applicability of one of the conventions: the Montreal Convention of 1999 (air law regime) or the Liability Convention of 1972 (space law regime). Liability regime created by the Liability Convention of 1972 is entirely focused on State-to State liability, thus, the state, as opposed to passengers or their relatives and third parties, is eligible for the compensation. In the same pattern, the state of origin will pay the compensation as opposed to the manufacturer or operator of the aerospace vehicle used in the suborbital flight. It seems that it is more reasonable for the point-to-point suborbital flights to fall under the passenger-oriented Montreal Convention of 1999. It is too remote to assess whether the Liability Convention of 1972 can be amended. In the last chapter of the article, there are some suggestions regarding comprehensive legal framework regulating the safety of P2P flights.

Keywords: *regulations on flight safety, P2P flights, space commercialization, space debris, space weaponization, space law treaties, the Montreal Convention 1999, The Liability Convention 1972.*

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