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Legal Aspects of Space Tourism

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I. INTRODUCTION

Broadly speaking, “space tourism” denotes any commercial activity that offers customers direct or indirect experience with space travel.¹ Such activities have many different designs, ranging from long-term stays in orbital facilities to short-term orbital or suborbital flights, and even parabolic flights in an aircraft exposing passengers to short periods of weightlessness.²

Flights into outer space by private individuals are finding increased attention in the public. While there are not yet chartered flights, occasional orbital flights with “space tourists” have taken place. So far, five “space tourists” have been taken to the International Space Station (“ISS”), all of whom were charged large sums of money for the experience. The fifth “tourist,” Charles Simonyi, recently flew to the ISS in April 2007.³ However, interest seems to be

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1. Stephan Hobe & Jürgen Cloppenburg, *Towards a New aerospace Convention? Selected Legal Issues of “Space Tourism,”* PROCEEDINGS OF THE FORTY-SEVENTH COLLOQUIUM ON THE LAW OF OUTER SPACE, 377, 377 (2004).

2. *Id.*

3. Charles in Space, <http://www.charlesinspace.com> (last visited July 29, 2007).

shifting to providing “cheaper flights” which are not aimed at the ISS but remain “suborbital” so that they are affordable for a somewhat broader public.

Yet, even with such short-term flights, a space tourist has different options. One option, modelled after *SpaceShipOne*,⁴ uses an aircraft to lift a space cabin to a certain altitude. The cabin then separates from the aircraft and continues its suborbital flight to higher altitudes. There are two possibilities for return when this method is used: (a) the space vehicle returns to where it started from, or (b) it returns to a different location on Earth (“space transportation”). A second option, which is modelled on the “*Delta Clipper Experimental*,”⁵ uses a rocket with a space capsule on top which is launched, and then the capsule separates from the rocket at a certain altitude. As a result, the passengers of the space capsule are exposed to Zero-G gravity and both vehicles return to Earth independent from each other. It is expected that Blue Origin’s “*New Shepard*” will use this method.⁶

“Space tourism” activities may thus include the use of an aircraft and/or spacecraft. Depending on where such activities actually take place, either air law or space law, or even both, may apply. The two legal regimes have historically evolved independently from each other and accordingly show some major differences. A variety of legal issues regarding the conduct of space tourism activities arise as a result. This Article focuses on some of the most problematic issues of relevance such as the delimitation of airspace and outer space, authorization to conduct space tourism, registration of the aircraft or

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4. SpaceShipOne is an experimental air-launched suborbital spaceplane using a hybrid rocket motor, which is ignited after the spaceplane has been released from its carrier airplane “White Knight.” It became “the first private manned spacecraft to exceed an altitude of 328,000 feet twice within . . . a 14 day period, thus claiming the ten million dollar Ansari X-Prize.” SpaceShipOne Captures X-Prize, http://www.scaled.com/projects/tierone/041004_spaceshipone_x-prize_flight_2.html (last visited Apr. 4, 2007). Prototypes of its successor, SpaceShipTwo, are to be completed in December 2007, with test flights beginning in 2008 and continuing until full FAA certification is obtained. Peter V. de Selding & Tariq Malik, *Virgin, Swedish Spaceport Sign Deal for Suborbital Flights*, SPACE NEWS 10, Feb. 5, 2007, available at http://www.space.com/spacenews/archive07/virginsweden_0205.html.
 5. The Delta Clipper Experimental: Flight Testing Archive, <http://www.hq.nasa.gov/pao/History/x-33/dc-xa.htm> (last visited July 29, 2007) (describing the Delta Clipper Experimental [DC-X], an unmanned prototype of a reusable single stage to orbit launch vehicle).
 6. Blue Origin’s New Shepard Reusable Launch Vehicle (“RLV”) is supposed to be launched “on suborbital, ballistic trajectories to altitudes in excess of 325,000 feet (99,060 meters) from a privately-owned space launched site.” It will include a fully reusable propulsion module operated under the control of on-board computers and a crew capsule on top capable of carrying three or more space flight participants to the edge of space. Leonard David, *Tourism Update: Jeff Bezos? Spaceship Plans Revealed*, http://www.space.com/businessstechnology/060705_blue_origin.html (2006).

spacecraft, liability to passengers and third parties, and the status of passengers.

Regarding air law, there are comprehensive regulations for passenger transportation in both international and national law. International space law, however, does not yet contain detailed regulations of passenger transport. In terms of national space laws, the United States was the first country to include specific reference to "space flight participants" in its national space law. Even if these U.S. regulatory activities are only of national character, however, they may indicate a tendency toward the regulation of space tourism activities on both the international and the national level. In this respect, it is interesting to note that on January 26, 2007, the Swedish government announced an agreement with Virgin Galactic concerning mid-summer and mid-winter flights of Virgin's "SpaceShipTwo" from Sweden's spaceport in Kiruna.⁷ Their Memorandum of Understanding calls for Swedish authorities to prepare a regulatory regime modelled on that of the U.S. Federal Aviation Administration ("FAA").⁸ Accordingly, a closer look at the respective recent U.S. regulatory initiatives seems most interesting.⁹

When examining these legal aspects, the question naturally arises whether existing laws are sufficient for future space tourism activities, or whether new international legal instruments or an amendment to an existing law or legal structure will become necessary.

II. APPLICABILITY OF AIR OR SPACE LAW

First, one must determine which legal regime—air law or space law—applies to space tourism activities. The delimitation of outer space is a recurring theme in every legal examination of issues regarding space tourism.

A. Delimitation of Airspace and Outer Space

There is no clear physical line between airspace and outer space. Nevertheless, the area above 110 km is generally regarded as being part of outer space. The status of the zone between 80 km and 110 km is highly controversial, however.¹⁰ Thus, if the parameters of a subor-

7. The Kiruna site agreement is the first one on SpaceShipTwo flights signed outside the United States. Selding & Malik, *supra* note 4, at 10.

8. *Id.*

9. For an account of the recent US regulatory environment, see Spencer H. Bromberg, *Public Space Travel—2005: A Legal Odyssey into the Current Regulatory Environment for United States Space Adventurers Pioneering the Final Frontier*, 70 J. AIR L. & COM. 639 (2005).

10. See Elmar Vitt, *Grundbegriffe und Grundprinzipien des Weltraumrechts*, in: HANDBUCH DES WELTRAUMRECHTS 35, 43 (Karl-Heinz Böckstiegel ed., 1991); Var-

bital flight are such that the space vehicle's maximum altitude is between 80 and 110 km, the issue of delimitation is crucial.

There are two common approaches to addressing this boundary issue. The "functional" approach makes a fixed boundary irrelevant, instead advertising a single legal regime for "spatial activities" depending on the nature or purpose of the activity.¹¹ On the other hand, the "spatial" approach attempts to determine a fixed boundary between airspace and outer space. The exact location of this boundary is controversial, however. The majority viewpoint seems to be that airspace extends to the point where the aerodynamic lift is exceeded by the centrifugal force, the *von Kármán* line, at an altitude of about 84 km. More recent state practice suggests that customary international law may emerge to the effect that the lowest perigee orbit of artificial earth satellites (approximately 95–110 km¹² above sea level) lies in outer space.¹³ It is interesting to note that Australia's Space Activities Act, as amended in 2002, requires a license for a launch from Australian territory only if the launch vehicle and/or payload are intended to reach an altitude of at least 100 km above sea level.¹⁴ Although national legislation cannot have a direct influence on international law, it might be regarded as an expression of an *opinio juris*.¹⁵

In the future, a boundary might be commonly accepted (or designed) at an altitude between 84 km and 100 km above sea level.¹⁶ For now, however, the legal status of the area between 80 and 110 km is not clear. Nevertheless, a distinct statement on the applicability of air or space law may be given in another context—such as the status of the vehicle.

B. Status of the Vehicle

The applicable legal regime in the doubtful area between 80 and 100 km above sea level might be established by qualifying the vehicles used in the space tourism activities. Here, the specific characteristics

lin J. Vissepó, *Legal Aspects of Reusable Launch Vehicles*, 31 J. SPACE L. 165 (2005) (providing a recent discussion of the different views).

11. Stephan Gorove, *Aerospace Object—Legal and Policy Issues for Air and Space Law*, 25 J. SPACE L. 101, 110 (1997); NICOLAS MATEESCO MATTE, *AEROSPACE LAW* 62–74 (1969).
12. The lowest perigee achieved so far is at 96 km. BIN CHENG, *STUDIES IN INTERNATIONAL SPACE LAW* 450–51 (1997).
13. *Id.* at 497; CARL Q. CHRISTOL, *THE MODERN INTERNATIONAL LAW OF OUTER SPACE* 504–05 (1982); Katherine M. Gorove, *Delimitation of Outer Space and the Aerospace Object—Where is the Law?*, 28 J. SPACE L. 11, 11–12 (1997); S. Gorove, *supra* note 11, at 102; Vitt, *supra* note 10, at 46.
14. SPACE ACTIVITIES AMENDMENT ACT 2002, No. 100 (2002) (AUSTL.), available at <http://scaleplus.law.gov.au/html/comact/11/6558/pdf/1002002.pdf>.
15. For details on emerging customary international law, see STEPHAN HOBE & OTTO KIMMINICH, *EINFÜHRUNG IN DAS VÖLKERRECHT* 184 (8th ed. 2004).
16. CHENG, *supra* note 12, at 450; CHRISTOL, *supra* note 13, at 506.

of the foreseen activities are crucial. This cannot be discussed in detail within the framework of this Article. It shall suffice to discuss the two main possibilities in broad terms as they seem to be developing today: a suborbital flight launched from an airplane and a suborbital flight in a capsule separated from a rocket launched from the ground or the High Seas.

If space tourism activities are modelled on *SpaceShipOne*, two objects must be distinguished: the aircraft and the space vehicle attached to the aircraft until the time of separation. Quite obviously, air law applies to the aircraft used both before and after separation. The question then is whether the space vehicle can be considered either an aircraft or a part of the aircraft before and after separation.

The term "aircraft" is mentioned in the Annexes to the Chicago Convention¹⁷ as well as in some national air laws, such as Article 1 of the German Air Traffic Code. Aircrafts are defined as "all machines which can derive support in the atmosphere from the reactions of the air."¹⁸ Until separation, the combined vehicle has the characteristics of an aircraft in terms of technical functions such as flight pattern and maneuverability: the space vehicle constitutes merely an additional cabin. Indeed, before separation, the space vehicle does not contribute to the propulsion and is fully dependent on the aircraft. Also, the dangers related to space missions are typically connected with the time of the launch, not with the transport by aircraft. Therefore, the aircraft and the attached space vehicle should be considered an "aircraft" until separation and air law should apply both to the aircraft and the space vehicle before separation. After separation, however, the space vehicle does not "derive support in the atmosphere from the reactions of the air" and should not be considered an aircraft. The vehicle may use the "reactions of the air" in the landing process, but it may be argued that partial fulfillment of the definition is not sufficient to qualify the vehicle as an aircraft. The purpose of the vehicle at that point further supports the conclusion that the vehicle should not be regarded as an "aircraft."

Instead, the suborbital vehicle may be regarded as a "space object" after separation from the aircraft. There is no full definition of the term "space object."¹⁹ It can be assumed, however, that the term is

17. Convention on International Civil Aviation ("Chicago Convention"), Dec. 7, 1944, 61 Stat. 1180, U.N.T.S. 295, Ninth Edition ICAO Doc. 7300/9 (Annex) (2006), available at http://www.icao.int/icao/arch/doc/7300/7300_9ed.pdf.

18. Convention on International Civil Aviation ("Chicago Convention"), Dec. 7, 1944, 61 Stat. 1180, 15 U.N.T.S. 295, Ninth Edition ICAO Doc. 7300/9 (Annex 6, 7, 8) (2006), available at http://www.icao.int/icaonet/arch/doc/7300/7300_9ed.pdf.

19. Yet, both the Liability Convention and the Registration Convention, two separate treaties, make it clear that the component parts of a space object, as well as its launch vehicle and parts thereof, are clearly included in the term "space object." Convention on International Liability for Damage Caused by Space Objects art.

used for any object that is launched or attempted to be launched into outer space.²⁰ The definition of the term “space object” is thus closely linked to the issue of delimitation of airspace and outer space. For the time being, the status of the entire zone between 80 km and 110 km is uncertain.²¹ But, if an attempted launch suffices for the qualification of a space object, it is likely that the purpose of the object will become a decisive factor.²² After its separation from the airplane, the suborbital vehicle might only reach an altitude just slightly below the lowest satellite perigee. Nonetheless, the vehicle clearly has the objective of reaching outer space, as can be seen from such flights being advertised as “space flights,” or space travel. Therefore, the suborbital vehicle after separation can be classified as a space object and space law should apply to the suborbital vehicle after separation from the aircraft.

Similarly, if a rocket was used to launch a space capsule, two objects would again need to be distinguished: the rocket and the space capsule attached to the rocket until the time of separation. Both of these objects could also reach an altitude just below the lowest satellite perigee—the demarcation not having been clearly made so far. However, both objects would be using rocket propulsion for thrust and would be intended to reach outer space. Thus, space law should apply to both objects before and after separation.

III. AUTHORIZATION

Authorization of space tourism activities is granted by national authorities in accordance with the relevant legal provisions of air and space law. As discussed above, air law will likely be applicable to the aircraft and the attached space vehicle prior to separation if an air launch is undertaken. In contrast, space law may be applicable to the separated suborbital vehicle using rocket propulsion for thrust, as well as to the two space objects used when a space capsule is launched by a rocket.

I(d), *opened for signature* Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention]; Convention on Registration of Objects Launched into Outer Space art. I(b), *opened for signature* Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention], both available at <http://www.unoosa.org/pdf/publications/STSPACE11E.pdf>.

20. Peter Malanczuk, *Haftung*, in: HANDBUCH DES WELTRAUMRECHTS 755, 787 (Karl-Heinz Böckstiegel ed., 1991); STEPHAN HOBE, DIE RECHTLICHEN RAHMENBEDINGUNGEN DER WIRTSCHAFTLICHEN NUTZUNG DES WELTRAUMS 133 (1992).
21. See Vitt, *supra* note 10, at 43.
22. HORST BITTLINGER, HOHEITSGEWALT UND KONTROLLE IM WELTRAUM 57 (1988); THE SPACE SHUTTLE AND THE LAW 4 (Stephen Gorove, ed., 1980); M. Hintz, *Weltraumgegenstände*, in HANDBUCH DES WELTRAUMRECHTS 157, 163 (Karl-Heinz Böckstiegel ed., 1991); ELMAR WINS, WELTRAUMHAFTUNG IM VÖLKERRECHT 89 (2000).

Under both international and national air law, an aircraft will require authorization. Since air law contains comprehensive and detailed regulations, authorization in this context does not raise further difficulties. The same cannot be said for space law.

After separation, the suborbital vehicle will require authorization according to international and national space law. If the space tourism activities are conducted by means of a space capsule launched by a rocket, authorization will also be required for both vehicles involved.

By virtue of Article VI of the Outer Space Treaty,²³ states are obligated to authorize and to continuously supervise their national space activities. This obligation can best be complied with by enacting national space legislation, preferably with a licensing regime for private activities in outer space, including certification of space vehicles.²⁴ For instance, examples of national laws that regulate licensing requirements for space activities can be found in Australia, Europe, Germany, Russia, and the U.S.

At this point, national space legislation often lacks specific regulations concerning space tourists. However, the U.S. recently set an example for such specific regulation with its Commercial Space Launch Amendment Act of 2004 ("CSLAA"). The amended Section 701 of Title 49 to the United States Code contains explicit reference to "space flight participants," enabling additional license requirements "for a launch vehicle carrying a human being for compensation . . ."²⁵ Further regulation was undertaken by the Department of Transportation with the FAA Draft Guidelines for Commercial Suborbital Reusable Launch Vehicle ("RLV") Operations with Space Flight Participants²⁶ and its Notice of Proposed Rulemaking for Human Space Flight Requirements for Crew and Space Flight Participants.²⁷ The Final Rule was issued on December 15, 2006, and became effective on February 13, 2007.²⁸

The most significant requirements for the licensing of any space activity carrying space flight participants include the following: (1)

23. "The activities of non-governmental entities in outer space . . . shall require authorization and continuing supervision by the appropriate State . . ." Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. VI, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205, available at <http://www.unoosa.org/pdf/publications/STSPACE11E.pdf> [hereinafter Outer Space Treaty].

24. See MICHAEL GERHARD, *NATIONALE WELTRAUMGESETZGEBUNG* 37 (2002).

25. 49 U.S.C. § 70105(b)(2)(D) (Supp. 2004).

26. Guidelines concerning flight crew were issued separately, but they are not within the scope of this Article.

27. Human Space Flight Requirements for Crew and Space Flight Participants, 70 Fed. Reg. 77,261 (Dec. 29, 2005).

28. Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed. Reg. 75,615 (Dec. 15, 2006) (to be codified at 14 C.F.R. pts. 401, 415, 431, 435, 440, & 460).

written information on the obligations of the licensee towards the space flight participant, (2) written informed consent by the space flight participant, (3) physical examination, (4) training, and (5) security requirements. These requirements are made clear by the following excerpts from several U.S. statutes:

(1) The licensee must inform the space flight participant in writing about the risks of the launch and re-entry, including the safety record of the launch/re-entry vehicle type.²⁹ This requirement is now implemented by 14 C.F.R. 460.45, which prescribes detailed provisions for the RLV operator's information obligation. Notably, the space flight participant must be given an opportunity to ask questions orally before flight.³⁰ Written information must be provided stating that the U.S. Government has not certified the launch vehicle as safe for carrying crew or space flight participants.³¹

(2) On the basis of this information, each space flight participant must provide his/her written informed consent in order to participate in the launch and re-entry.³²

(3) The space flight participant must provide written certification of compliance with the physical examination, if such is required.³³ However, the FAA does not require a space flight participant to obtain a physical examination.³⁴

(4) An operator must provide training of each space flight participant before flight, especially on how to react in emergency situations.³⁵

(5) The FAA final regulations establish that an operator must implement security requirements to prevent any space flight participant from jeopardizing the safety of the flight crew or the public.³⁶

Regarding authorization of space flights including space tourists, it can be summarized that international space law does not have specific regulations. Moreover, most national space legislation also fails to provide specific regulations, albeit the recent U.S. regulations provide some minimum requirements and take into account the increasing prevalence of space tourism activities. The regulations establishing the information obligations, the informed consent requirement, and the training and security measures are particularly important.

IV. REGISTRATION

The national legal regime applicable on board the aircraft or space object will depend upon the registration of the aircraft or space object.

29. 49 U.S.C. § 70105(b)(5)(A) (Supp. 2004).

30. 14 C.F.R. § 460.45(f) (2007).

31. 14 C.F.R. § 460.45(b) (2007).

32. 49 U.S.C. § 70105(b)(5)(C) (Supp. 2004); 14 C.F.R. § 460.45(f).

33. 49 U.S.C. § 70105(b)(5)(C).

34. Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed. Reg. 75,615, 75,626 (Dec. 15, 2006) (to be codified at 14 C.F.R. pts. 401, 415, 431, 435, 440, & 460).

35. 14 C.F.R. § 460.51 (2007).

36. 14 C.F.R. § 460.53 (2007).

Registration is of utmost importance for a state to be able to exercise jurisdiction and control.

If space tourism activities are modelled on *SpaceShipOne*, the space vehicle should be considered a part of the aircraft prior to separation and should share its registration. Provisions concerning registration of an aircraft in international air law are contained in Articles 17–21 and Annex 7 of the Chicago Convention.³⁷ According to Article 17 of the Chicago Convention, an aircraft shall have the nationality of the state in which it is registered. The registration or the transfer of registration of the aircraft shall be made in accordance with the national laws and regulations of any contracting state to the Chicago Convention.³⁸ Because air law provides comprehensive and detailed regulations, registration does not raise further difficulties in the context of air law.

After separation, the space vehicle should be registered as a “space object” in accordance with Article II of the Registration Convention.³⁹ If there is more than one “launching state” involved, an agreement between the parties is required to determine which state shall register the launched space object.⁴⁰ However, an object can only be registered as a space object from the time of the “launch.”⁴¹ With respect to the *SpaceShipOne* model, it seems most sensible to consider the separation of the suborbital vehicle from the aircraft as the “launching” of the space object.⁴² This way, the problem of possible dual registration, resulting in a conflict of jurisdictions, can be avoided. As a result, the space vehicle becomes a “space object” when it separates from the aircraft. From that moment on, the vehicle should be registered in accordance with the Registration Convention. The state of registry of the aircraft would be the “launching state.” According to Article VIII of the Outer Space Treaty, the state of registry “shall retain jurisdiction and control over such object, and over any personnel hereof, while in outer space”

In a case where the space capsule is launched with a rocket, registration requirements are exclusively defined by international and national space law. Both objects could be qualified as space objects, and, in such cases registration would follow the same rules as registration

37. Convention on International Civil Aviation (“Chicago Convention”), Dec. 7, 1944, 61 Stat. 1180, 15 U.N.T.S. 295, Ninth Edition ICAO Doc. 7300/9 (2006), available at http://www.icao.int/icaoenet/arch/doc/7300/7300_9ed.pdf.

38. *Id.* at art 19.

39. “When a space object is launched into Earth orbit or beyond, the launching State shall register the space object . . . in an appropriate registry which it shall maintain.” Registration Convention, *supra* note 19, at art. II(1).

40. *Id.* at art. II(2).

41. *See id.* at art. II(1).

42. *See* Stephen Gorove, *Toward a Clarification of the Term “Space Object”—An International Legal and Policy Imperative?*, J. SPACE L. 11, 18 (1993).

of the suborbital vehicles used with space tourism activities modelled after *SpaceShipOne*.

In summary, the aircraft used in an air launch, as well as the space vehicle prior to separation, would need to be registered according to air law. In contrast, the space vehicle used in an air launch, as well as both space objects used when a space capsule is launched by a rocket, must be registered according to space law. Specifically, registration must be pursuant to the Registration Convention and national space laws. However, the Registration Convention does have deficiencies in light of a marked decrease in the registration of space objects.⁴³ Accordingly, the UN Committee on the Peaceful Uses of Outer Space (“UN COPUOS”) Working Group on the Practice of States and International Organizations in Registering Space Objects has considered altering the Registration Convention to make it more effective in registering space objects. Its objective is to “encourage States to adhere to the Registration Convention, improve the application and enhance the effectiveness of the Convention and assist in developing and strengthening national legislative norms relating to the registration of objects launched into outer space.”⁴⁴ With increased space tourism activities occurring on more of a regular basis, classification of space vehicles used as space objects would certainly necessitate the effectiveness of the Registration Convention.

V. LIABILITY

Matters of liability are of major interest to operators of space tourism activities who need to assess their potential financial risk. In terms of liability, “passenger liability”—also referred to as contractual liability—and “third-party liability,” must be distinguished. When passengers voluntarily take the risk of participating in the flight, they form a contractual relationship with the operator and/or licensee. Conversely, third parties are not involved in the activities and have no contractual link with either the operator or licensee.

If space tourism activities are modelled on *SpaceShipOne*, the law governing liability will likely be determined based on whether the space vehicle is still attached to the aircraft or whether the two objects have separated. When the aircraft is attached to the suborbital vehicle, the relevant air law provisions may be applicable. For example, the Montreal Convention of 1999 (“Montreal Convention”) and the Rome Convention of 1952 (“Rome Convention”) may apply if both parties are Parties to these Conventions. Once separated, space law, such

43. See Forty-Fifth Session, Vienna, Austria, Apr. 3–13, 2006, *Report of the Legal Subcommittee on its forty-fifth session*, ¶ 135, U.N. Doc. A/AC.105/871 (Apr. 24, 2006), available at http://www.unoosa.org/pdf/reports/ac105/AC105_871E.pdf.

44. *Id.* ¶ 130.

as the Liability Convention of 1972 ("Liability Convention"), may apply to the suborbital vehicle using rocket propulsion for thrust. The Liability Convention would also apply to both space objects if the space capsule is launched by a rocket.

A. Passenger Liability

Regarding passenger liability for damage occurring while on board the aircraft, the Montreal Convention⁴⁵ and its two-tier system of liability might apply. In cases of passenger injury or death, the Montreal Convention provides for unlimited liability of carriers.⁴⁶ Limited liability, however, may apply to damages in case of delay if the carrier proves that "all necessary measures" were taken to avoid the damage.⁴⁷ For other damages, the carrier's liability is limited to 100,000 Special Drawing Rights ("SDRs") if he or she proves that the damage was not due to the negligence or other wrongful act or omission of the carrier (or its servants or agents) or that such damage was solely due to the negligence or other wrongful act or omission of a third party.⁴⁸

Yet, the Montreal Convention only applies to "international carriage of persons" by aircraft. Such carriage is international, if "according to the agreement between the parties, the place of departure and the place of destination . . . are situated . . . within the territories of two States Parties . . ." ⁴⁹ Arguably, the location where the separation of the suborbital vehicle from the aircraft takes place can be perceived as the "place of destination," since the journey on board an aircraft ends there.⁵⁰ In such a situation, an international carriage may be doubtful if the location of separation is in the airspace of the state in which the aircraft took off. Yet, even if the provisions of the Montreal Convention were not applicable to the transportation by the (combined) aircraft, the flight of the aircraft would be covered by the relevant provisions of national air law. Since the Montreal Convention aims at harmonizing the liability provisions of national air laws, it does not make much of a difference in practice whether the provisions of the Montreal Convention or the respective national liability provisions apply.

However, the Montreal Convention is not applicable to transportation on board the space vehicle after separation from the aircraft.

45. Convention for the Unification of Certain Rules Relating to International Carriage by Air, May 28, 1999, S. Treaty Doc. No. 106-45, available at www.luft-hansa-cargo.com/download.jsp?file=publish/download/mc.pdf [hereinafter Montreal Convention].

46. 3 ELMAR GIEMULLA ET AL., MONTREALER ÜBEREINKOMMEN: FRANKFURTER KOMMENTAR ZUM LUFTVERKEHRSRECHT Art. 21, n.1 (Apr. 2006).

47. Montreal Convention, *supra* note 45, at art. 18.

48. *Id.* at art. 17.

49. *Id.* at art. 1.

50. Hobe & Cloppenburg, *supra* note 1, at 379.

Space law may apply to the separated vehicle using rocket propulsion for thrust. For damage caused by a launching state's "space object on the surface of the Earth or to aircraft in flight," the Liability Convention⁵¹ establishes a regime of absolute liability of that "launching state."⁵² Fault-based liability of the space objects' launching state applies to damage caused by a space object other than on the surface of the Earth, to a space object of another launching state, or to persons or property on board such space object.⁵³

It is unclear whether the Liability Convention can apply to passengers of a space object. Article VII of the Liability Convention makes it clear that the Liability Convention does not apply to damage caused by a space object of a launching state to nationals of that same state and to "foreign nationals during such time as they are participating in the operation of that space object"⁵⁴ This statement indicates that the Liability Convention is not applicable to passengers, whether they are nationals of the launching state of the space object or whether they are passengers who are not nationals of that launching state but are participating in the operation of its space object.

However, it could be argued that the Liability Convention applies to passengers since they are usually not "participating in the operation" of the space object. Yet, by participating in a space mission, passengers of a space flight voluntarily put themselves at a high risk. Against this background, absolute liability of the launching state for damages caused to passengers of its space object seems inappropriate. Moreover, Article III of the Liability Convention clearly refers to cases where third parties are involved, so that fault-based liability cannot be applied with respect to passengers.

Therefore, passengers likely cannot claim compensation under the Liability Convention.⁵⁵ This has been criticized because the protection of passengers is important for the success of the industry.⁵⁶ However, the responsibility and liability of states seems less acceptable in an era of purely commercial space transportation.⁵⁷

If the Liability Convention is inapplicable, liability may be established according to national laws. It shall suffice here to outline the main characteristics of the respective national systems. If the applicable national law so provides, passenger liability can either be estab-

51. Liability Convention, *supra* note 19, at art. II.

52. *Id.*

53. *Id.* at art. III.

54. *Id.* at art. VII.

55. See Malanczuk, *supra* note 20, at 791; WINS, *supra* note 22, at 126.

56. Ram Jakhu & Raja Bhattacharya, *Legal Aspects of Space Tourism*, PROCEEDINGS OF THE FORTY-FIFTH COLLOQUIUM ON THE LAW OF OUTER SPACE 112, 129 (2002).

57. Patrick Collins & Koichi Yonemoto, *Legal and Regulatory Issues for Passenger Space Travel*, PROCEEDINGS OF THE FORTY-FIRST COLLOQUIUM ON THE LAW OF OUTER SPACE 224, 232 (1998).

lished by contract or by criminal or tortious conduct. Contracts can contain a choice-of-law provision. Regarding criminal and tortious conduct, the law of the state of registry applies to acts committed on board a space object.

National space legislation with explicit reference to passengers, or “space flight participants,” has recently been enacted in the U.S. The approach could serve as an incentive for further legislation at the national and international level. The U.S. legislation has some implications on reciprocal waivers of claims, excluding liability between the parties to the waiver. Some waivers are required by the legislation, whereas others may be possible, but are not compulsory. For instance, key requirements of applicable laws in the U.S. include the following:

(1) The licensee is required to make a reciprocal waiver of claims with “its contractors, subcontractors and customers”⁵⁸ Since a space flight participant is not a “customer” the provision does not apply to passengers.⁵⁹ However, the operator is not prevented from making a waiver of liability a condition of an agreement with the space flight participant.⁶⁰

(2) Moreover, the licensee has to make a reciprocal waiver of claims with the U.S. Government under which each party agrees to be responsible for property damage or loss it sustains, or for personal injury to, death of, property damage or loss sustained by, *inter alia*, space flight participants, if the damage results from an activity under the license.⁶¹ Such waiver of claims only applies to any amount exceeding the insurance or demonstration of financial responsibility required under subsection (a)(1)(B) of section 70112,⁶² that is, to an amount exceeding U.S. \$100 million.

(3) The space flight participant must hold harmless and indemnify the U.S. Government and its agencies, servants, agents, subsidiaries, employees and assignees from and against liability, loss or damage arising out of claims brought by anyone for property damage or bodily injury, including death, sustained by, *inter alia*, a space flight participant, resulting from licensed or permitted activities.⁶³

The approach taken by the U.S. shows that liability waivers are permitted under certain circumstances. With the final regulations, the FAA made it clear that waivers encompass claims arising out of an individual’s own death.⁶⁴ After all, it must be reiterated that the Liability Convention does not yet apply to passengers. As a national regulation, the U.S. legislation is of limited applicability on a worldwide

58. 49 U.S.C. § 70112(b)(1) (Supp. 2004).

59. 14 C.F.R. § 440.3(2) (2007).

60. Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed. Reg. 75,615, 75,627 (Dec. 15, 2006) (to be codified at 15 C.F.R. pts. 401, 415, 431, 435, 440, & 460).

61. 49 U.S.C. § 70112(b)(1).

62. 49 U.S.C. § 70112(b)(2) (Supp. 2004).

63. 14 C.F.R. § 440.17(e)–(f) (2007).

64. Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed. Reg. at 75,627.

scale, albeit it may provide an incentive for future legislation both on the national and international level.

So far, international space law does not contain adequate regulation concerning liability for damages of space flight participants. Since the Montreal Convention may not be applicable to the second part of the journey and the Registration Convention has its deficiencies, amendments to existing instruments, or even a new instrument altogether, may become necessary in the future.

B. Third-Party Liability

Third-party liability with respect to transportation by aircraft is regulated by the Rome Convention⁶⁵ if it is applicable to a particular incident. The Rome Convention provides only for liability of the operator, presumably the owner of the aircraft⁶⁶ and not the tour operator, upon proof that the damage on the surface was caused by an aircraft in flight or by any person or thing falling there from.⁶⁷ Liability is therefore limited.⁶⁸ Nevertheless, unlimited liability applies if the person who suffers damage proves that it was caused by "a deliberate act or omission of the operator . . . done with the intent to cause damage . . ." ⁶⁹ Because very few states have ratified the Rome Convention, its relevance is very limited.⁷⁰ The International Civil Aviation Organization ("ICAO") is currently discussing a renewal of the third-party liability convention that could be based on a system similar to the two tier system of the Montreal Convention on passenger liability.

After separation, the space vehicle should not be considered an aircraft, rendering the Rome Convention inapplicable. Third parties might be able to claim compensation under the Liability Convention, however. The Liability Convention refers to cases in which third parties are concerned about damages that are not attributable to the launching state of the space object causing the damage. As noted earlier, Article VII(a) of the Liability Convention states that the Liability Convention is not applicable to damage caused to nationals of the

65. Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface ("Rome Convention") Oct. 7, 1952, 310 U.N.T.S. 181, available at <http://www.dot.gov/ost/ogc/Rome1952.pdf>.

66. *Id.* at art. 2(1).

67. *Id.* at art. 1(1).

68. *Id.* at art. 11.

69. *Id.* at art. 12(1).

70. Only 49 states have ratified the Rome Convention. Although Russia is a party to the Convention, many other prominent countries are not, including Germany, the United Kingdom, Australia, the United States, France, and Japan. See Parties Signing the Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface, <http://www.icao.int/icao/en/leb/rome1952.pdf> (last visited July 29, 2007).

“launching state.”⁷¹ Therefore, the launching state’s own nationals have to rely on national laws, usually providing only for fault-based liability. This inequality can be dealt with by national space legislation.⁷²

As a treaty of international law, the Liability Convention applies only between states. Thus, only a launching state within the meaning of Article I(c) of the Liability Convention⁷³ will be liable for damage under the provisions of the Liability Convention—not nationals of the launching state who caused the damage. The launching state may have recourse against its nationals if national space legislation so permits. Liability according to the Liability Convention may be a prerequisite for a right of recourse of the launching state under its national space legislation. Notably, on the other side of these claims may be an injured national. It is at the discretion of the state concerned whether or not to present a claim on behalf of such a plaintiff.⁷⁴ Indeed, many national space laws foresee such a right of recourse.⁷⁵

The recent U.S. legislation might serve as an example of existing and potential future legislation. Section 701 of Title 49 of the United States Code establishes risk sharing. The licensee must obtain liability insurance or demonstrate financial responsibility for the maximum probable loss arising from claims by a third party and from claims by the U.S. Government for damage or loss to government property so as to compensate the U.S. in the event it is held liable for damages in accordance with the Liability Convention or the Federal Tort Claims Act.⁷⁶ The maximum insurance coverage required for third-party liability is U.S. \$500 million.⁷⁷ Concerning the amount exceeding the required financial responsibility up to U.S. \$1.5 billion, Section 70113(a)(1) provides for the conditional payment of claims by the U.S. Government for third-party liability.⁷⁸ After those limits, the li-

71. Liability Convention, *supra* note 19, at art. VII.

72. GERHARD, *supra* note 24, at 190.

73. Liability Convention, *supra* note 19.

74. VALÉRIE KAYSER, LAUNCHING SPACE OBJECTS: ISSUES OF LIABILITY AND FUTURE PROSPECTS 52 (R. Jakhu et al. eds., 2001).

75. See, for example, Section 6 of the Act on Space Activities (Sweden), Section 10(1) of the Outer Space Act (Great Britain), Article 30 in Law of the Russian Federation “About Space Activity,” the Space Act (Russia), and 74(2) of the Space Activities Act 1998 (Australia). It is not possible to go into the specific details of these national legislations in the framework of this Article.

76. 49 U.S.C. § 70112(a)(1) (2000); Cf. KAYSER, *supra* note 74, at 96–98, 115–16; E. Jason Steptoe, *Regulation of Private Commercial Space Transportation by the United States Department of Transportation*, PROCEEDINGS OF THE TWENTY-EIGHTH COLLOQUIUM ON THE LAW OF OUTER SPACE 240 (1985).

77. 49 U.S.C. § 70112(a)(3) (2000).

78. 49 U.S.C. § 70113(a)(1) (Supp. 2004); 49 U.S.C. § 70112(a)(1), (3) (2000).

censee is responsible for all claims.⁷⁹ As a result, the licensee is liable for damages not exceeding the amount of U.S. \$500 million, which has to be covered by the insurance or demonstration of financial responsibility. For the amount exceeding U.S. \$500 million up to U.S. \$1.5 billion, the U.S. Government pays valid claims. For amounts exceeding U.S. \$1.5 billion, the licensee is liable. The U.S. legislation is obviously only of national scope, but it might reflect a tendency for future national and international legislation.

If a space capsule is launched by a rocket, the applicable liability regime is defined exclusively by international and national space law. Since both objects could be qualified as space objects, air law provisions would not apply.

In summary, it can be stated that in air law the Montreal Convention applies to passenger liability and the Rome Convention applies to third-party liability regarding damages by the aircraft, if such is involved in the space activity. With respect to damages connected with the space object(s), the Liability Convention is not applicable to passenger liability. Instead, liability for damages to passengers may be established by contract or through criminal or tortious conduct, according to national laws. Although the Liability Convention is applicable to damages to third parties, it only directly applies between states. However, states may have recourse against their nationals causing the damage if national law so provides.

VI. THE STATUS OF SPACE TOURISTS

Generally, the states exercising jurisdiction over a person have the authority to determine the rights and duties of passengers. However, international law contains a number of more specific regulations.

Again, when using the *SpaceShipOne* model, it is important to distinguish between the aircraft and the space vehicle attached to it until separation. Before separation, the space vehicle is a part of the aircraft, whereas after separation it may qualify as a space object depending on the parameters of the mission. If a rocket is used to launch the space capsule, both objects—rocket and capsule—are space objects.

Whereas international law and most national laws lack a general definition of the term “personnel of an aircraft,” it is obvious that passengers cannot come under this term. Space tourists are obviously passengers in terms of air law, and as a result, they fall clearly under the command of the aircraft commander.

When transportation by the vehicle must be considered as transportation by a space object, the status of space tourists must be deter-

79. Human Space Flight Requirements for Crew and Space Flight Participants, 70 Fed. Reg. 77,261, 77,271 (Dec. 29, 2005).

mined. The main question here is whether such passengers can be considered astronauts, or whether they should be granted a status similar to that of astronauts. This could have a considerable impact on passenger rights and obligations. For instance, the first sentence of Article V(1) of the Outer Space Treaty obliges states to render to astronauts "all possible assistance in the event of accident, distress, or emergency landing on the territory of another State party or the High Seas."⁸⁰ Thus, the main implications of the status of an astronaut are obligations in case of emergency, which are further specified in the Rescue Agreement.⁸¹ According to the Rescue Agreement, such obligations apply more generally to "personnel of a spacecraft."⁸² Moreover, Article V of the Outer Space Treaty confers to astronauts the status of "envoy of mankind." This seems to be of rather symbolic value though. The preparatory works in UN COPUOS suggest that states did not assume that any specific legal rights or duties would result from the status as "envoy of mankind."⁸³

The terms "astronauts,"⁸⁴ "personnel of a spacecraft,"⁸⁵ and "envoy of mankind,"⁸⁶ have not yet been defined in international space law. As has been observed, they bear different connotations: "astronaut" has a more explorative or scientific meaning, "personnel" has a more functional meaning, and "envoy of mankind" has a more humane meaning.⁸⁷

Whereas Article V of the Outer Space Treaty speaks of "astronauts" and "envoys of mankind," Article VIII uses the term "personnel." It is clear that Article VIII of the Outer Space Treaty was not intended to exempt passengers from the jurisdiction and control of the state of registry. Thus, a broad interpretation might seem appropriate, including not only persons involved in the operation of the spacecraft, but also passengers.⁸⁸ This is in line with the term "personnel"

80. These terms have been chosen so as to cover all situations where personnel of a spacecraft may conceivably need assistance. See Roy S. K. Lee, *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, in 1 Manual on Space Law 53, 60 (Nandasiri Jasentuliyana & Roy S. K. Lee eds., 1979).

81. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, *opened for signature* Apr. 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119, available at <http://www.unoosa.org/pdf/publications/STSPACE11E.pdf> [hereinafter Rescue Agreement].

82. *Id.* at art. 1.

83. G. Lafferranderie, *Pour une Charte de l'Astronaute*, ANNALS OF AIR & SPACE L.; LEOPOLD PEYREFITTE, DROIT DE L'ESPACE 190 (1993).

84. Outer Space Treaty, *supra* note 23, at art. V.

85. Rescue Agreement, *supra* note 81, at art. 2.

86. Outer Space Treaty, *supra* note 23, at art. V.

87. Jakhu & Bhattacharya, *supra* note 56, at 119.

88. Horst Bittlinger, *Menschen im Weltall*, in Handbuch des Weltraumrechts 205, 222 (Karl-Heinz Böckstiegel ed., 1991); George Paul Sloup, *Legal Regime of International Space Flights: Criminal Jurisdiction and Command Authority Aboard*

as used in the Rescue Agreement, which clearly aims to include all persons on board.⁸⁹ The term "envoy of mankind" should be understood in the context of the mission of the astronaut, which he or she is supposed to be conducting in the interest of all mankind.⁹⁰

Passengers could thus be regarded as "personnel" of a space object, with the consequence that the state of registration could exercise jurisdiction and control over every person on board the space object.⁹¹ If the personnel of a space object visit the space object of another state of registry in outer space, these individuals should come under the jurisdiction and control of the state of registration of the visited space object.⁹²

However, the opinion has been expressed that only persons that exercise certain functions with respect to the operation of the space vehicle can be regarded as "personnel."⁹³ Also, states may not be willing to grant privileges and immunities of personnel to travellers on board a suborbital transport vehicle who do not participate as specialists in a mission or who do not represent their countries for research purposes.⁹⁴ The profile of these passengers does not correspond with the image of astronauts that states had in mind when drafting the Rescue Agreement. Furthermore, the relatively short period of time that these persons will spend in outer space can militate against a privileged treatment of passengers.

Whether a suborbital vehicle can be considered a "space object" depends on the profile of the mission. If the space vehicle is intended to reach an altitude which would qualify the object as a "space object," the moment of "launch" was established as the moment of separation. Such interpretation would, however, result in a change in the status of passengers at the time of separation. It is highly desirable to find a

the Space Shuttle/Spacelab, PROCEEDINGS OF THE TWENTY-FIRST COLLOQUIUM ON THE LAW OF OUTER SPACE 148, 151 (1978); V.S. Vereshchetin, *Legal Status of International Space Crews*, ANNALS OF AIR & SPACE L. 545, 550 (1978); FRANS GERHARD VON DER DUNK, PRIVATE ENTERPRISE AND PUBLIC INTEREST IN THE EUROPEAN 'SPACESCAPE' 28 (1998).

89. Stephen Gorove, *Legal and Policy Issues of the Aerospace Plane*, 16 J. SPACE L. 147, 151 (1988).

90. PEYREFITTE, *supra* note 83, at 190.

91. See BITTLINGER, *supra* note 22, at 91; Sloup, *supra* note 88, at 151; Vereshchetin, *supra* note 88, at 550.

92. Bittlinger, *supra* note 88, at 215; *but see* CHENG, *supra* note 12, at 488.

93. Collins & Yonemoto, *supra* note 57, at 232; Stephan Gorove, *Interpreting Salient Provisions of the Agreement on the Rescue of Astronauts, and Return of Objects Launched in Outer Space*, PROCEEDINGS OF THE ELEVENTH COLLOQUIUM ON THE LAW OF OUTER SPACE 93, 93 (1968); PEYREFITTE, *supra* note 83, at 195; Lesley Jane Smith & Kay-Uwe Hörl, *Legal Parameters of Space Tourism*, PROCEEDINGS OF THE FORTY-SIXTH COLLOQUIUM ON THE LAW OF OUTER SPACE 37, 41 (2003); MARCO G. MARCOFF, TRAITÉ DE DROIT INTERNATIONAL PUBLIC DE L'ESPACE, 265 (Editions Universitaires Fribourg Suisse 1969) (1973).

94. Smith & Hörl, *supra* note 93, at 39.

solution which would make the persons on board a vehicle subject to the same legal requirements throughout the entire journey.

International space law has not yet reached a level where the legal status of commander, crew, and passengers are sufficiently defined.⁹⁵ Some aspects of specific space law, in particular the legal documents relating to the International Space Station (“ISS”), do indicate a trend toward the clarification of the astronaut’s definition and the status of crew and passengers.⁹⁶ Explicit reference is made to the various types of persons engaged in space travel. For example, in early 2002, the space agencies participating in the ISS project reached an agreement as to who was allowed on the ISS (“the 2002 Agreement”).⁹⁷ According to the 2002 Agreement, there are two types of crewmembers: “professional astronauts/cosmonauts” and “spaceflight participants.” According to the Agreement:

A professional astronaut/cosmonaut is an individual who has completed the official selection and has been qualified as such at the space agency of one of the ISS partners and is employed on the staff of the crew office of that agency.

Spaceflight participants are individuals (e.g. commercial, scientific and other programs; crewmembers of non-partner space agencies, engineers, scientists, teachers, journalists, filmmakers or tourists) sponsored by one or more partner(s). Normally, this is a temporary assignment that is covered under a short-term contract.⁹⁸

Such crewmembers can be further divided into the categories of expedition or visiting crewmembers:

Expedition crewmembers are the main crew of the ISS and are responsible for implementing the planned activities for an increment. The right of a partner to have its candidates serve as expedition crewmembers is allocated in accordance with Article 11.1 of the MOUs. As part of this allocation, it may be possible to have spaceflight participants as part of an expedition once the ISS has a crew complement of more than 3 persons.

Based on experience to date with visiting vehicles to the ISS, **visiting crewmembers** travel to and from the ISS, but are not expedition crewmembers. Consequently, the visiting crewmembers do not count as a use of a sponsoring agency’s allocation of flight opportunities or crew time on-orbit rights as defined in Article 11.1 and Article 8.3.c of the MOUs. They may be either professional astronauts/cosmonauts or spaceflight participants.⁹⁹

95. *See id.*

96. *See, e.g.,* Philippe Achilleas, *L’astronaute en droit international*, LEGAL AND ETHICAL FRAMEWORK FOR ASTRONAUTS IN SPACE SOJOURNS 13 (2004); Steve Freeland, *Up, Up, and . . . Back: The Emergence of Space Tourism and its Impact on the International Law of Outer Space*, 6 CHI. J. INT’L L. 1, 1 (2005).

97. Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers (2002), *available at* <http://www.spaceref.com/news/viewsr.html?pid=4578>.

98. *Id.*

99. *Id.*

The 2002 Agreement further provides general guidelines for selection, assignment and training of ISS crewmembers and defines certain criteria with regard to the certification of crew flight readiness.

Apart from international space law, national laws could specify the way jurisdiction and control shall be exercised on space objects that are on the national registry.¹⁰⁰ In this respect, it is interesting to refer back to the recent U.S. legislation, which also introduces, as we have seen, the notion of "space flight participant." The term is defined as "an individual, who is not crew, carried within a launch vehicle or reentry vehicle."¹⁰¹

Taking all these aspects into account, it could be argued that passengers participating in space tourism activities should indeed come under the command of the space flight commander. However, they have only minor functions to fulfil in a space mission, if at all. Whether they are considered as crew or not, their subordinate function in space travel should be clearly reflected in their status.

VII. CONCLUSION

Short-term suborbital flights are most likely to happen in the foreseeable future. As discussed above, such activities may raise considerable problems with the legal regimes of airspace and outer space. This is due in part to the fact that these two regimes have hitherto not really been connected with each other. But as discussed, there may be some need to find coherent solutions that profit from well-known conceptions both of air law and space law.

100. G. Catalano Sgrosso, *Legal Status of the Crew in the International Space Station*, PROCEEDINGS OF THE FORTY-SECOND COLLOQUIUM ON THE LAW OF OUTER SPACE 35, 37 (1999).

101. 49 U.S.C. § 70102(17) (Supp. 2004).