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Frans G. von der Dunk

University of Nebraska - Lincoln, fvonderdunk2@unl.edu

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von der Dunk, Frans G., "The Integrated Approach—Regulating Private Human Spaceflight as Space Activity, Aircraft Operation, and High-Risk Adventure Tourism" (2013). *Space, Cyber, and Telecommunications Law Program Faculty Publications*. 77.
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The Integrated Approach – Regulating Private Human Spaceflight as Space Activity, Aircraft Operation, and High-Risk Adventure Tourism

Frans G. von der Dunk

University of Nebraska-Lincoln, Lincoln, Nebraska, USA
fvonderdunk2@unl.edu

ABSTRACT

One of the overriding issues concerning private human spaceflight concerns how to properly regulate this specific new type of activity. Noting that in the discussion regarding regulation thereof usually the three distinct regimes of space law, air law and high-risk adventure tourism law are drawn upon to look for solutions, the present paper addresses the key elements of each of these approaches as they are to some extent already currently being applied and where, as a consequence, gaps and overlaps arise, as well as presents an effort to address the latter in a sensible, coherent, efficient and feasible manner.

Article history: Received March 1, 2012; received in revised form May 10, 2012; accepted May 19, 2012; available online June 13, 2012; author's version archived in the UNL institutional repository August 2014

Keywords: Private human spaceflight, Space tourism, Suborbital flights, Space law, Air law, High adventure tourism law

1. Introduction: The Hybrid Character of Private Human Spaceflight

When a new development arises, for the purpose of trying to devise a proper system of law and regulation lawyers always tend to look for existing regimes that might be of application, or at least of help, in order not to have to reinvent the wheel all over again. This also applies to private human spaceflight, defined for the present purpose as “flights of humans intended to enter outer space (a) at their own expense or that of another private person or entity, (b) conducted by private entities, or (c) both.” Thus, it is important to note that from a technical and operational perspective private human spaceflight encompasses many aspects from three fields of human activity in particular: space activities, aviation, and high-risk adventure tourism.

Firstly, as to the space aspect. Of course private spaceflight and its most visible component space tourism not accidentally make reference to outer space: the aim is to reach at least the lower parts of that area.” Whilst even the plans currently

being close to realization already vary from air-launched second stage spacecraft to single-stage horizontal take-off vehicles, all of them make use of some form of rocket propulsion for the middle section of the flight profile. All are intended to reach a realm where the atmosphere is, if at all present, thin enough to result in some form of ‘re-entry’ into the (real) atmosphere as part of the downward part of the flight profile. Whether for fun or for scientific experiments, all present

¹ See e.g. L. Billings, Exploration for the masses? Or joy-rides for the ultra-rich? Prospects for space tourism, 22 *Space Policy* (2006), 163; R.D. Launius & D.R. Jenkins, Is it finally time for space tourism?, 4 *Astropolitics* (2006), 254-5, 272-4; J. Loizou, Turning space tourism into commercial reality, 22 *Space Policy* (2006), 289-90; R.S. Jakhu & Y.O.M. Nyampong, International regulation of emerging modes of space transportation, in J. Pelton (Ed.), *Space Safety Regulations and Standards* (2010), 219-20; E. Walter, The privatisation and commercialisation of outer space, in C. Brünner & A. Soucek (Eds.), *Outer Space in Society, Politics and Law* (2011), 500-1; M. Gerhard, Space Tourism – The Authorisation of Suborbital Space Transportation, in F.G. von der Dunk (Ed.), *National Space Legislation in Europe* (2011), 279-88.

micro-gravity as a major selling point of their ventures. Some in addition also advertise with selling points such as views of the curvature of the earth and the atmosphere. All these are elements typically associated with spaceflight. Markets to be targeted concern the servicing of public (as this has already happened with the International Space Station²) or private (Bigelow's soon-to-be space hotels) destinations orbiting in outer space.

Secondly, also comparisons with aviation abound.³ Historically, the development of aviation, with prize money inciting daredevils like Charles Lindbergh and auguring in a first phase of flying largely for the sheer excitement of it, finds many echoes in the current stage of private manned spaceflight. Much of the technology in particular for the first phases of the flight profile comes straight out of aviation – or, for example in the case of Virgin Galactic, simply includes an aircraft as a 'first stage' vehicle. Most of the flights envisaged for the near future will use airports for take-off and landing, will only for a small, upper part of the hyperbolic flight profile leave what is commonly referred to as 'airspace' – and will consequently also interfere with normal aviation activities taking place in the area. At a later stage, furthermore, some of the technologies are intended to be used for point-to-point aviation-like transportation across the globe. Here, the space-part of the trajectory is more like a helpful incident than a main target or a crucial element of the flight.

Thirdly, at least as long as the discussion still concerns private flights of a few hours at most and landing where they took off, they are indeed comparable also to tourism, more specifically high-risk adventure tourist activities such as bungee jumping, helicopter-skiing or survival treks.⁴ These are all activities voluntarily undertaken by paying customers essentially for the fun and thrill of it as they are, after all, not without certain inherent dangers.

² Cf. e.g. Billings, 163; S. Negoda, *Legal Aspects of the Commercial Development of the Russian Segment of the ISS*, 28 *Air & Space Law* (2003), 90-4; R. Sattler, *US Commercial Activities aboard the International Space Station*, 28 *Air & Space Law* (2003), 79-81; L.J. Smith & K.U. Hörl, *Legal Parameters of Space Tourism*, *Proceedings of the Forty-Sixth Colloquium on the Law of Outer Space* (2004), 38-9; R.P. Veldhuyzen & T.L. Masson-Zwaan, *ESA Policy and Impending Legal Framework for Commercial Utilisation of the European Columbus Laboratory Module of the ISS*, in F.G. von der Dunk & M.M.T.A. Brus, *The International Space Station Commercial Utilisation from a European Perspective* (2006), 62.

³ See e.g. S. Hobe & J. Cloppenburg, *Towards a New Aerospace Convention? Selected Legal Issues of "Space Tourism"*, in *Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space* (2005), 378-81; P. van Fenema, *Suborbital Flights and ICAO*, 30 *Air and Space Law* (2005), 399-403; R. Abeyratne, *Space Tourism – Parallel Synergies Between Air and Space Law?*, 53 *Zeitschrift für Luft- und Weltraumrecht* (2004), 184 ff.; Gerhard, 268-78.

⁴ See e.g. T. Knutson, *What is "Informed Consent" for Space-Flight Participants in the Soon-to-Launch Space Tourism Industry?*, 33 *Journal of Space Law* (2007), 105 ff.; Z.N. O'Brien, *Consumer Protection and the Limitation of Liability in the National Regulation of the Space Industry*, *Proceedings of the Forty-Eighth Colloquium on the Law of Outer Space* (2006), 229-32; Z.N. O'Brien, *Advertising of Private Commercial Space Services in the European Community*, *Proceedings of the Forty-Ninth Colloquium on the Law of Outer Space* (2007), 50; A. Cartier & I. Cristoiu, *Space Tourism: Regulatory Framework of Private Initiatives and Projects with a Special Interest on RLV Regulations*, *Proceedings of the Forty-Ninth Colloquium on the Law of Outer Space* (2007), 39.

It is not surprising then that also the three respective legal regimes for those categories of activities in principle and/or at first sight bear great relevance to the impending private human spaceflight activities.⁵ This may lead to the possibility of overlaps of applicable regimes and the resulting overall incoherence or inversely, since no single regime can claim to be comprehensively applicable, even to gaps in law and regulation. Choices will therefore have to be made, and those choices will not necessarily all point in the same direction.

Prior to actually making such choices, however, at least an evaluation needs to be undertaken of the key characteristics of those three regimes, of space law, air law and high-risk adventure tourism law respectively. Such an analysis, moreover, should at least ideally be undertaken at both the international level and at the level where individual states address the issues legally speaking. This is the main target of the current article.

2. Space Law and Private Human Spaceflight

The application of space law to private human spaceflight principally derives from the framework at the international level, more in particular the four treaties developed in the bosom of the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS) in the course of the 60s and 70s which were widely ratified.⁶ In this context, national law has taken a back-seat, generally being established after (and in first instance mainly as implementation of) those international treaties.

The most fundamental provisions stem from the 1967 Outer Space Treaty,⁷ which established a number of rules applicable to a realm labelled 'outer space' on the basis of legally characterizing that area as a 'global commons,' which is a realm where no territorial sovereignty of any individual state can apply.⁸ States are held internationally responsible for any activities in that realm as long as these can be qualified as "national activities" of the state in question, and are consequently obliged – at least if they are held to be the

⁵ Most of the analyses referenced in footnotes 1, 3 and 4 *supra* actually also address in some detail the applicability of the respective regimes.

⁶ Cf. e.g. S. Freeland, *Up, Up and ... Back: The Emergence of Space Tourism and Its Impact on the International Law of Outer Space*, 6 *Chicago Journal of International Law* (2005), 4-6; Hobe & Cloppenburg, 380-1; Jakhu & Nyampong, 220-4.

⁷ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS6347; 6 ILM 386 (1967).

⁸ See e.g. Artt. I, II, VI, Outer Space Treaty. Further e.g. on the hoax of 'ownership' of parts of the moon e.g. the IISL Board of Directors Statements at <[http://www.iislweb.org/docs/IISL Outer Space Treaty Statement.pdf](http://www.iislweb.org/docs/IISL%20Outer%20Space%20Statement.pdf)> and <<http://www.iislweb.org/docs/Statement%20BoD.pdf>>; also P.M. Stems & L.I. Tennen, *Privateering and Profiteering on the Moon and Other Celestial Bodies: Debunking the Myth of Property Rights in Space*, *Proceedings of the Forty-Fifth Colloquium on the Law of Outer Space* (2003), 58-62; F. Tronchetti, *The Non-Appropriation Principle under Attack: Using Article 11 of the Outer Space Treaty in its Defence*, *Proceedings of the Fiftieth Colloquium on the Law of Outer Space* (2008), 526-36; F.G. von der Dunk et al., *Surreal estate: addressing the issue of 'Immovable Property Rights on the Moon'*, 20 *Space Policy* (2004), 149-56.

“appropriate State” to do so—to undertake proper “authorization and continuing supervision” of such activities.”

This is one angle from which individual states have found it necessary to establish national space laws and regulations for cases where such national activities in outer space are undertaken by non-state actors, read essentially private commercial operators. In particular with respect to private human spaceflight (which really started being developed only in the first years of the present millennium), the international treaties alluded to did not provide much relevant detail. Therefore it was—and still is—largely up to such national law and regulation to address the specifics of this novel type of space activities.

In cases where states had such national laws already in place for private space activities *not* involving manned spaceflight, it was a logical step to first and foremost consider extending the scope of, and adapting such legislation to this end. The only state having actually done so is the United States, which since 1984 had a national law, including a licensing system for private launch operators, in place with the enunciation of the Commercial Space Launch Act in its original version.¹⁰ The resulting regime was adapted to address the specifics of private human spaceflight, for the first time in 2004 by means of the Commercial Space Launch Amendments Act¹¹ and as further elaborated by the FAA Human Space Flight Requirements.¹² Moreover, in recent years individual states within the United States have started to proclaim statutes governing private human spaceflight, such as Florida, New Mexico, Texas, and Virginia, as will be discussed further below.¹³ Essentially, these statutes try to make the respective states more attractive (still) to potential providers of private human spaceflight services.

Several other states possess a national space law and are currently engaged in plans for private human spaceflight but as of yet have not in any meaningful sense adapted it for the

purpose. This concerns Sweden¹⁴ (in the light of Virgin Galactic’s plans to launch from Kiruna), the United Kingdom¹⁵ (notably concerning ideas to develop a private spaceport in Scotland), the Netherlands¹⁶ (with a view to the plans of Space Expedition Curaçao (SXC) to launch from the Caribbean part of the Kingdom of the Netherlands) and France¹⁷ (in view of apparent interests to develop such operations from the center of the country).

In order to, *inter alia*, implement the state responsibility those states felt they might incur for possible private (so far unmanned) ventures into outer space, those laws generally included licensing and oversight requirements and competences with respect to private operators holding the nationality of the state concerned, operating from the territory of the

¹⁴ Cf. Act on Space Activities, 1982: 963, 18 November 1982; *National Space Legislation of the World*, Vol. I (2001), at 398; *Space Law Basic Legal Documents*, E.II.1; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), at 11; [http://www.unoosa.org/oosa/en/SpaceLaw/national/sweden/act on space activities 1982E.html](http://www.unoosa.org/oosa/en/SpaceLaw/national/sweden/act%20on%20space%20activities%201982E.html); and Decree on Space Activities, 1982: 1,069; *National Space Legislation of the World*, Vol. I (2001), at 399; *Space Law Basic Legal Documents*, E.II.2; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), at 11; [http://www.unoosa.org/oosa/en/SpaceLaw/national/sweden/decree on space activities 1982E.html](http://www.unoosa.org/oosa/en/SpaceLaw/national/sweden/decree%20on%20space%20activities%201982E.html). See already Von der Dunk, *Private Enterprise*, 129-34; further e.g. Marboe & Hafner, 34; N. Hedman, *Swedish Legislation on Space Activities*, in C. Brunner & E. Walter (Eds.), *Nationales Weltraumrecht/National Space Law* (2008), 73-80.

¹⁵ Cf. Outer Space Act, 18 July 1986, 1986 Chapter 38; *National Space Legislation of the World*, Vol. I (2001), at 293; *Space Law Basic Legal Documents*, E.I.; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), at 12; <http://www.legislation.gov.uk/ukpga/1986/38/introduction>. See already Von der Dunk, *Private Enterprise*, 134-41; further e.g. Marboe & Hafner, 35-6; S. Mostesher, *Regulation of Space Activities in the United Kingdom*, in R.S. Jakhu (Ed.), *National Regulation of Space Activities* (2010), 359-62.

¹⁶ Cf. Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects, 24 January 2007; 80 *Staatsblad* (2007), at 1; *Nationales Weltraumrecht/National Space Law* (2008), at 201; [http://www.unoosa.org/oosa/en/SpaceLaw/national/netherlands/space activities actE.html](http://www.unoosa.org/oosa/en/SpaceLaw/national/netherlands/space%20activities%20actE.html). See further e.g. Marboe & Hafner, 37-8; H. de Brabander-Ypes, *The Netherlands Space Law An introduction to contents and dilemma’s*, Presentation held at the 47th session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space, <http://www.oosa.unvienna.org/pdfpresnsczmajpres-nz.pdf>, last accessed 4 May 2012; F.G. von der Dunk, *Regulation of Space Activities in The Netherlands*, in R.S. Jakhu (Ed.), *National Regulation of Space Activities* (2010), 225-45.

¹⁷ Cf. Law on Space Operations (*Loi relative aux opérations spatiales*); *Loi n° 2008-518 du 3 juin 2008*; 34 *Journal of Space Law* (2008), at 453; unofficial translation 34 *Journal of Space Law* (2008), at 453. See further e.g. Marboe & Hafner, 39-40; P. Clerc & F. Cahuzac, *Advance in the Implementation of the French Space Law on Space Operations in the Launcher Field*, *Proceedings of the International Institute of Space Law 2009* (2010), 400-6; P. Achilleas, *Regulation of Space Activities in France*, in R.S. Jakhu (Ed.), *National Regulation of Space Activities* (2010), 109-12; A. Kerrest de Rozavel & F.G. von der Dunk, *Liability and Insurance in the Context of National Authorisation*, in F.G. von der Dunk (Ed.), *National Space Legislation in Europe* (2011), 155-61.

¹⁸ For a more extended overview, cf. F.G. von der Dunk, *Towards ‘flags of convenience’ in space?*, Paper presented at the IISL/ECSL Symposium at the occasion of the opening session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space, Vienna, 19 March 2012, to be published in *Proceedings of the International Institute of Space Law 2012* (2013).

⁹ Art. VI, Outer Space Treaty. Cf. also e.g. E. Back-Impallomeni, *Article VI of the Outer Space Treaty, United Nations Treaties on Outer Space: Actions at the National Level*; *Proceedings United Nations/Republic of Korea Workshop on Space Law* (2004), 75; E. Back-Impallomeni, *Necessities for the Development of National Space Law*, in C. Brunner & E. Walter (Eds.), *Nationales Weltraumrecht/National Space Law* (2008), 28-30.

¹⁰ Commercial Space Launch Act, Public Law 98-575, 98th Congress, H.R. 3942, 30 October 1984; 98 Stat. 3055; *Space Law Basic Legal Documents*, E.II.1.3; now codified as 51 U.S.C. Chapter 509. See further F.G. von der Dunk, *Private Enterprise and Public Interest in the European ‘Spacescape’* (1998), 111-8; I. Marboe & F. Hafner, *Brief Overview over National Authorization Mechanisms in Implementation of the UN International Space Treaties*, in F.G. von der Dunk (Ed.), *National Space Legislation in Europe* (2011), 40-2; P.A. Vorwig, *Regulation of Private Launch Services in the United States*, in R.S. Jakhu (Ed.), *National Regulation of Space Activities* (2010), 405-19.

¹¹ Commercial Space Launch Amendments Act, Public Law 108-492, 108th Congress, 23 December 2004; 118 Stat. 3974; now codified as 51 U.S.C. Chapter 509.

¹² 14 C.F.R. §§ 401 ff., *Human Space Flight Requirements for Crew and Space Flight Participants*; Final Rule 71, FR 75615 of 15 December 2006.

¹³ See *infra*, § 4.

state concerned, or both.¹⁸ Further specific national policies or idiosyncrasies were also reflected. For example, the US act also applied to companies majority-owned or controlled by US Citizens,¹⁹ the UK act very much was drafted to address satellite communications²⁰ and the Dutch act for the time being did not, for internal political reasons, extend to the Caribbean parts of the Kingdom.²¹

As mentioned, states are internationally responsible under the Outer Space Treaty for private space activities in outer space. The delineation thus required of a realm labelled 'outer space' as set off against a realm of air space of course translates into the issue of where, vertically speaking, outer space begins, for the purpose of determining where the elements of the regime of space law sketched above would be applicable. To summarize the ongoing discussion on this issue: whilst so far no authoritative, international agreement has arisen on a clearly defined borderline between air space and outer space, a tendency may be discerned to increasingly but informally accept such a borderline at a 100 km above sea level, which may (or may not) develop into a proper customary rule of international law.²² At the same time, with present-day aircraft usually only capable of flying up to much lower altitudes than a 100 km and satellites so far requiring to be operated at altitudes of well over a 100 km in order to stay in orbit,²³ the need for establishing such an exact borderline may not be immediate.

¹⁹ See Secc. 50904(a X3) *juncto* 50902(1)(c), 51 USC Chapter 509. This was largely for national security-related considerations.

²⁰ Cf. Sec. 2, Outer Space Act; in the perceived absence of likelihood at the time especially of launches conducted on UK territory the Act did not *ipso facto* apply to space activities conducted from UK territory, only to space activities conducted by UK companies as defined which *de facto* at the time concerned satellite communications only.

²¹ See Sec. 2(1), Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects. The Kingdom of the Netherlands, it should be added, had ratified all five UN-developed space treaties also on behalf of the Caribbean dependencies, including Curaçao.

²² Cf. e.g. the case of Australia, which amended its 1998 space act in 2002, redefining "launch," "return" and "space object" by replacing the reference to "outer space" with the phrase "an area beyond the distance of 100 km above mean sea level;" Sec. 8, An act about space activities, and for related purposes, No. 123 of 1998, assented to 21 December 1998; *National Space Legislation of the World*, Vol. I (2001), at 197; as amended by Act No. 100 of 2002; <http://www.comlaw.gov.au/Details/C2010C00193>. See further on this issue e.g. F. Lyall & P. Larsen, *Space Law: A Treatise* (2009), 153-73; Freeland, 6-10; Gerhard, 280-82; S. Hobe, Legal Aspects of Space Tourism, 86 *Nebraska Law Review* (2007), 441-2; T. Neger & E. Walter, Space law, an independent branch of the legal system, in C. Brunner & A. Soucek (Eds.), *Outer Space in Society, Politics and Law* (2011), 239-41; M. Chatzipanagiotis, *The legal status of space tourists in the framework of commercial suborbital flights* (2011), 617; earlier already C.Q. Christel, *The Modern International Law of Outer Space* (1982), 502-11.

²³ However, authors rather diverge on altitudes quoted: B. Cheng, *Studies in International Space Law* (1997), 448, refers to approximately 50 miles (80 km) (while at 450 pointing at one satellite actually having achieved a perigee as low as 96 km); likewise E.C. Dolman, *As-tropolitik: Classical Geopolitics in the Space Age* (2002), 115, refers to some 52 miles (or some 83 km); Lyall & Larsen, 168, refer (rather tentatively) to some 90 km/48 miles; J.J. Sellers, *Understanding Space: An Introduction to Astronautics* (2004), 73, refers to some 130 km (or about 81 miles); E.P. Chatters, B. Eberhardt & M.S. Warner, *Orbital Mechanics*, in *AU-18 Space Primer* (2009), 97, refer to some 150 km (some 93 miles).

The situation in terms of setting off outer space as a different legal realm from air space, however, is considerably more complex. Some other parts of the space law regime are tied in not so much with *where an event takes place*, but with whether a 'space object' is involved, almost regardless of *where such a space object may find itself*. Most prominently, this concerns the international law developed for liability caused by space activities, which has been constructed as a regime for liability caused by such space objects as per Article VII of the Outer Space Treaty and the whole of the follow-on 1972 Liability Convention.²⁴

The first problem here, also relevant for private human spaceflight, is the absence of a definition of 'space object' (other than a rather circular one which includes the "component parts of a space object as well as its launch vehicle and parts thereof" in the concept).²⁵ The general opinion may well hold this to refer essentially to any manmade artefact 'launched' into outer space, but this still begs the questions (1) where outer space would begin and (2) what the word 'launch' refers to.²⁶ The former question has, of course, already been briefly addressed above.

As to the latter question, the underlying assumption was perhaps that a launch constituted a kind of vertical departure aiming at entering outer space using rocket engines. Any such assumption, however, may well have been 'corrupted' by air launches conducted for example by Pegasus. In such cases, the proper spacecraft was released from underneath an airplane in mid-air where the very first part of the trajectory essentially is a horizontal one—whose activities were still legally defined as 'launches' at least for the purpose of the Liability Convention.²⁷ As a consequence, as of today there is no singular, generally accepted legal definition of 'launch.'

With a view to possible application of the applicable regime to private human spaceflight, this makes it more likely to apply the label of 'space object' to some of the technical/operational concepts for private human spaceflight (e.g. Blue Origin, Armadillo Aerospace) than to others (e.g. the XCOR vehicle, as this essentially constitutes an aircraft-like vehicle able to take off, traverse the air space and enter outer space in one seamless operation), with two-stage vehicles (such as WhiteKnightTwo-plusSpaceShipTwo) somewhere in between. However, where the boundary lies between what should be considered a space object and what not is far from clear-and there would be excellent arguments for including even XCOR types of vehicles within the concept of 'launch,' for the simple reason of its intention to reach outer space.²⁸

A second key issue in the context of private space activities results from the, in principle, fourfold definition of the liable entity, the "launching State," as the "State which launches or

²⁴ Convention on International Liability for Damage Caused by Space Objects (Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 10 ILM 965 (1971).

²⁵ Art. I(d), Liability Convention.

²⁶ See e.g. B. Cheng, *Studies in International Space Law* (1997), 324-6, esp. 464, 493-5; Hobe & Cloppenburg, 381.

²⁷ Thus, Pegasus as a US company operating from US territory required licenses under the Commercial Space Launch Act for such activities.

²⁸ Cf. also Gerhard, 264-5; Chatzipanagiotis, 17-25.

or procures the launching of a space object (...) [and/ or the] State from whose territory facility a space object is launched.”²⁹ In other words, one or more states will be held liable on the international level also for damage caused by space objects privately constructed, launched and/or operated – a liability, moreover, which is in principle without limit.³⁰ Consequently, along the same lines as state responsibility, which has given rise to a (small but growing) number of states taking the initiative to establish a national space law-cum-licensing system, the liability which these states would incur has led them to prominently include in such systems and the resulting licenses clauses regarding reimbursement of such state liability and attendant insurance obligations for the licensees concerned.

Here, once again states have been exercising their own discretion regarding how to handle reimbursement and insurance. Some states concerned, such as Sweden, have chosen to essentially shift the unlimited liability to the licensee, barely allowing for exceptions.³¹ Others, such as the United States, have in a fundamental way limited the reimbursement obligations, effectively turning the national treasury into an insurer of damage above the limit of such obligations.³² Some states moreover require insurance statutorily, whether up to a limit or not, whereas others leave that to the individual licensing process.³³

Furthermore, the lack of precision in the international terminology has led different states to apply their national regulatory and licensing regimes in different fashion. What, for example, should be included in the concept of ‘procurement’ of a launch, so as to require a license including liability arrangements? States have, indeed, also here chosen varying inter-

pretations, giving rise to varying scopes of actual licensing-cum-reimbursement obligations.³⁴ Any lack of an internationally harmonized legal framework for private space activities would become a real issue especially now that other national authorities than the FAA are being forced to consider developing specific regimes for private *manned* space activities.

On the other hand, as of yet development of a *de facto* harmonized legal framework cannot be ruled out. The Dutch and Curaçao authorities for example may well follow the US approach in substance when it comes to regulating SXC’s activities (even if partly because vehicle developer XCOR is a US company). Likewise, the Swedish authorities at least originally were contemplating a similar approach for Spaceport Sweden (even if partly because Virgin Galactic’s technology and Virgin Galactic itself are also of US nationality). With regard to other projects currently being discussed it is probably fair to say that these are not yet advanced enough to allow any distinct conclusion as to the regulatory and licensing approaches that will be undertaken.

A final point to be made here specifically with a view to private human spaceflight is that international space law does *not* provide for any regime regarding liability of spaceflight operators to humans on board of their spacecraft.³⁵ In the era when the space treaties were drafted (as well as for some time thereafter) all such humans were astronauts in the service of public space agencies, not in any true sense ‘passengers’ contracting for a (transport) service. Consequently any liability in case these humans would suffer injuries or death was regulated, if at all, through their employment contracts. This constitutes probably the most prominent area of private human spaceflight where currently (international) space law does not provide for any helpful pointers.

3. Air Law and Private Human Spaceflight

In contrast to space law, air law has been primarily developed at a national level, then harmonized in certain areas at the international level. At both levels, moreover, the approach has once more been twofold.

On one hand, many of the legal rules that were developed simply apply to ‘airspace’; a definition thereof by way of limiting its vertical extension long being considered a purely academic issue. The 1944 Chicago Convention³⁶ provides the baseline here. It spells out the main obligations for international aviation and consequently to that extent narrows the sovereign discretion of national authorities to regulate such air transport from their end. In that capacity, it restates the fundamental rule that “every State has complete and exclusive sovereignty over the

²⁹ Art I(c), Liability Convention.

³⁰ Cf. Art. XII, Liability Convention, providing in relevant part: “The compensation which the launching State shall be liable to pay for damage under this Convention shall be determined in accordance with international law and the principles of justice and equity, in order to provide such reparation in respect of the damage as will restore the person, natural or juridical, State or international organization on whose behalf the claim is presented to the condition which would have existed if the damage had not occurred.”

³¹ Cf. Sec. 6, Act on Space Activities; under this clause a limit to the reimbursement can only be granted when “special events” would so justify.

³² Cf. Sec. 50912(a), Commercial Space Launch Act.

³³ Of the five states particularly relevant from the perspective of impending human spaceflight, the United States (see Sec. 50912(a)(1), Commercial Space Launch Act), the Netherlands (cf. Sec. 3(4), 12, Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects) and France (see Art. 6, Law on Space Operations) require insurance by statute; the United Kingdom (as per Sec. 5(f), Outer Space Act) “may (...) require[e] the licensee to insure himself” (emphasis added) but has in fact established a policy to always do so; whereas the Swedish Act on Space Activities does not refer to ‘insurance’ or any related obligation at all. See C. Gaubert, Insurance in the Context of National Authorisation, in F.G. von der Dunk (Ed.), *National Space Legislation in Europe* (2011), 165-74; cf. also Marboe & Hafner, 61-5.

³⁴ Amongst the five states of special interest here, currently only the United Kingdom (see Sec. 1(a), Outer Space Act) and France (see Art. 2(3), Law on Space Operations) explicitly require a license *ipso facto* for the procurement of a launch. The other three states only upon closer analysis do require licenses for certain (but differently delineated) sets of activities which could qualify as ‘procurement’ argu-

(footnote continued)

ably. See also Marboe & Hafner, 53-4.

³⁵ This is of course, as will be seen further below, in complete contrast to national and international air law.

³⁶ Convention on International Civil Aviation (Chicago Convention), Chicago, done 7 December 1944, entered into force 4 April 1947: 15 UNTS 295; TIAS 1591; ICAO Doc. 7300.

airspace above its territory," and only refers to its horizontal extension.³⁷

On this basis, states have established within their national territories and airspaces a comprehensive set of domestic rules regarding navigation, safety of aviation and allowing (or conditioning, or even prohibiting) the transport of passengers. This, subject only to such general international rules as came to be agreed upon and ratified by the state at issue, for example in the context of the same Chicago Convention. This Convention, it should be added, turned out to focus on the navigation and safety aspects of international aviation, for example addressing air traffic management, air traffic control, certification of aircraft and licensing of air crews.³⁸ The commercial aspects of air transport were largely dealt with by the famous system of bilateral air service agreements between individual pairs of states. The mirror-side to such, within the broad parameters of the Chicago Convention rather comprehensive, sovereign discretion to regulate even international aviation as far as a state's own airspace was concerned was the fundamental responsibility of states for the safety of such air transport in that airspace.³⁹

Thus, in as far as private human spaceflight involves airspace—which it inevitably does, in the case of the current projects even for a major portion of the flight—such rules could, in principle, also be applicable to such flights, at least to that extent.⁴⁰ The same would apply to bilateral air service agreements, once a next phase of private human spaceflight would see passengers being transported from A to B (both A and B being places on earth).

On the other hand, a considerable amount of rules of air law mirrors the discussion on 'space objects,' as they are triggered by a vehicle being involved which conforms to the definition of an "aircraft," being "any machine that *can* derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface."⁴¹ The use of the word "can" points out that, with the exception of craft which can only operate in a completely ballistic mode, all envisaged vehicles for private human spaceflight would

fit the bill, and hence entail application of the regimes which the existence and operation of aircraft trigger. Strictly speaking therefore, it is not necessary for a vehicle to actually "derive" such "support" for any portion of the flight to qualify as aircraft, as long as it would at least have (had) the option to do so.

Thus, the application of both the contractual liability and third-party liability regimes of air law is made contingent upon transport on board of aircraft.

The contractual liability regime ranges from the 1929 Warsaw Convention⁴² to the 1999 Montreal Convention.⁴³ It effectively requires states parties to establish alternatively harmonize national law requiring aircraft operators to compensate damage caused to passengers and cargo on board of *aircraft* in the course of transportation by such aircraft (or during embarkation or disembarkation)⁴⁴ in accordance with whatever terms the relevant treaty regime prescribes. Which treaty is applicable precisely in which given case moreover is *not* determined by the partisanship of the state in whose airspace a particular aircraft happens to be flying at the time of the incident, but by the partisanship of the states of departure and arrival of the flight at issue.⁴⁵

Third-party liability was most recently—on the international level—regulated by the 1952 Rome Convention⁴⁶ as later amended by the 1978 Montreal Protocol.⁴⁷ It has to be noted here that a 2009 Convention⁴⁸ has not yet entered into force and that the amount of states parties to the Rome Convention and the Montreal Protocol is fairly limited, making national law applicable forthwith in the majority of cases. In *all* cases, the application of the liability provisions are contingent upon an *aircraft* being the cause of the damage concerned, as already the titles of the aforementioned documents amply make clear.

Further complicating the general picture, the application of criminal air law rests upon a combination of the applicability of the concepts of 'aircraft' respectively 'air space.' The first treaty to address the issue was the 1963 Tokyo

³⁷ Art. 1. Chicago Convention, resp. Art. 2, providing: "For the purposes of this Convention the territory of a State shall be deemed to be the land areas and territorial waters adjacent thereto under the sovereignty, suzerainty, protection or mandate of such State." See further e.g. Gerhard, 268; Freeland 7-8; J.B. Marcicq et al., *Towards Regulating Suborbital Flights: An Updated EASA Approach*, Paper IAC-IO-D2.95, 61st International Astronautical Congress, Prague, 2010, 2.

³⁸ Cf. esp. Art. 22-36, Chicago Convention. Further e.g. Van Feneema, 401-3; Marcicq, 2.

³⁹ Cf., further to the general concept of state responsibility in international law, Art. 28, Chicago Convention, which was interpreted to give rise to this specific state responsibility in conjunction with such general rules on responsibility of a state for events and activities within its sovereign jurisdiction as per public international law. See also e.g. Artt. 12, 22, 25. See further F.P. Schubert, *An International Convention on GNSS Liability: When Does desirable Become Necessary?* 24 *Annals of Air and Space Law* (1999), 252-4; M. Bartkowski, *Responsibility for Air Navigation (ATM) in Europe*, 21 *Annals of Air and Space Law* (1996), 46 ff.: Chatzipanagiotis, 144.

⁴⁰ See esp. Gerhard, 268 ff.

⁴¹ E.g. Annex 7 to the Chicago Convention, *Aircraft Nationality and Registration Marks*, 5th edition, July 2003, Definitions: Annex 8, *Airworthiness of Aircraft*, 10th edition, April 2005, Definitions.

⁴² Convention for the Unification of Certain Rules Relating to International Transportation by Air (Warsaw Convention), Warsaw, done 12 October 1929, entered into force 13 February 1933; 137 LNTS 11; USTS 876; UKTS 1933 No. 11. Cf. e.g. Hobe & Cloppenburg, 378-80; Chatzipanagiotis, 86-93.

⁴³ Convention for the Unification of Certain Rules for International Carriage by Air (Montreal Convention), Montreal, done 28 May 1999, entered into force 4 November 2003; 2242 UNTS 350; ICAO Doc. 9740; 48 *Zeitschrift für Luft- und Weltmännrecht* (1999), at 326. Cf. e.g. Chatzipanagiotis, 94-5.

⁴⁴ Cf. e.g. Art 17, Warsaw Convention; Art. 17(1), Montreal Convention.

⁴⁵ Cf. e.g. Art. 1(2), Warsaw Convention; Art. 1(2), Montreal Convention.

⁴⁶ Rome Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface (Rome Convention), Rome, done 7 October 1952, entered into force 4 February 1958; 310 UNTS 181; ATS 1959 No. 1; ICAO Doc. 7364. Cf. e.g. Chatzipanagiotis, 141.

⁴⁷ Protocol to Amend the Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface Signed at Rome on 7 October 1952 (Montreal Protocol), Montreal, done 23 September 1978, entered into force 25 July 2002; ICAO Doc. 9257.

⁴⁸ Convention on Compensation for Damage Caused by Aircraft to Third Parties, Montreal, done 2 May 2009; not yet entered into force; ICAO Doc. 9919. See further e.g. Chatzipanagiotis, 141-7.

Convention.⁴⁹ It provided that the state in whose airspace an aircraft registered with another state is flying is the primary state entitled to exercise its “criminal jurisdiction over an offence committed on board” – although the former state should not do so unless other criteria apply.⁵⁰ Additional treaties and protocols, such as the 1970 Hague Convention,⁵¹ generally followed the same approach.

In other words, once and to the extent that the vehicles intended for use by private human spaceflight would be considered ‘aircraft,’ provided of course the various other requirements for application of the respective conventions would equally be fulfilled, their respective regimes would also apply on board those private human spaceflight vehicles.

However, whilst on the international level the aforementioned, rather broad definition of ‘aircraft’ would indeed be applicable as such to most vehicles concerned, at a secondary level this may not be as helpful for applying an extensive and well-weathered set of rules as one might expect. At the national level, in many cases the application of elaborate and specially crafted sets of rules is made contingent upon an aircraft belonging to a *specific category* of aircraft, referring to such criteria as size, use and operational characteristics, or to *specific types of operations* regardless of the craft used. The new category of private human spaceflight vehicles respectively flights may fit ill into any of those.

A good example would be existing aviation legislation applicable to Curaçao, the intended venue for a spaceport to allow flights of the XCOR Lynx vehicle as of 2014. Would for example, for the purpose of airworthiness certification, such a vehicle qualify as a “utility aircraft,” “acrobatic aircraft,” “light aircraft” or “experimental aircraft”?⁵² Differences are also made under the regulations between aircraft of more respectively less than 5,700 kg-where the Lynx would fit into the latter category.⁵³ And as to operations, the regulations fundamentally differentiate between such various activities as ‘commercial air traffic,’⁵⁴ round

trips,⁵⁵ “aerial work” flights,⁵⁶ and ‘special aviation activities.’⁵⁷ Each of these enjoy their own set of regulatory parameters, standards and requirements (semi-) automatically following from characterization of operations as following within their ambit.

It is also illustrative within this context to briefly address the effort which the European Aviation Safety Agency (EASA)⁵⁸ started to engage in. This concerned plans to develop an appropriately specific certification regime for the craft to engage in suborbital flights – at least to the extent that these qualify as ‘aircraft,’ which most of the current designs do – and, once that regime would be sufficiently developed, start addressing attendant safety issues such as those related to crew and passenger licensing and certification.⁵⁹

General acceptance of such an air transport-oriented approach to private human spaceflight is not a foregone conclusion, however. This may be glanced from the fact that the EASA efforts currently seem to have been put on hold. Equally, the International Civil Aviation Organization (ICAO),⁶⁰ though acknowledging the applicability of the general definition of ‘aircraft’ to most or even all of the vehicles being designed, has decided to desist from developing Standards and Recommended Practices (SARPs) for such suborbital vehicles or the operations conducted with them.⁶¹ This, it was indicated, at least for as long as the flights concerned would be from A to A and not, normally, straddle more than one national airspace.

In the end, therefore, it seems that at this stage any broad and generic application of air law by way of semi-automatic application of the relevant definitions, developed as it is in detail with a view to ‘normal’ aviation, raises more problems and issues than it solves. Appropriately accommodating (some of the) general principles and concepts of air law would still require a major development of detailed rules, regulations and standards almost from scratch-without the benefit, as of yet, of much relevant statistical data and

⁴⁹ Convention on Offences and Certain Other Acts Committed on Board Aircraft (Tokyo Convention), Tokyo, done 14 September 1963, entered into force 4 December 1969; 704 UNTS 219; 2 ILM 1042 (1963); ICAO Doc. 8364. See e.g. Abeyratne, 190–3; Chatzipanagiotis, 43–4.

⁵⁰ Namely, if “(a) the offence has effect on the territory of such State [being overflown]; (b) the offence has been committed by or against a national or permanent resident of such State; (c) the offence is against the security of such State; (d) the offence consists of a breach of any rules or regulations relating to the flight or manoeuvre of aircraft in force in such State; [or] (e) the exercise of jurisdiction is necessary to ensure the observance of any obligation of such State under a multilateral international agreement”; Art. 4, in conjunction with Art. 1(2), Tokyo Convention.

⁵¹ Convention for the Suppression of Unlawful Seizure of Aircraft (Hague Convention), The Hague, done 16 December 1970, entered into force 14 October 1971; 860 UNTS 105; TIAS 7192; ICAO Doc. 8920. Cf. further e.g. Abeyratne, 190–3; Chatzipanagiotis, 44–5.

⁵² All require airworthiness certificates in conformity with a detailed set of rules; see Sec. 5.4.1.3(1), Civil Aviation Regulations Netherlands Antilles, Part 5, Airworthiness: P.B. 2008, no. 19.

⁵³ See Art. 128, *Landsbesluit toezicht luchtvaart*, 24 April 2003: P.B. 2003, no. 56.

⁵⁴ Cf. Art. 1(v), *Luchtvaartlandsverordening*, 20 December 2001: P.B. 2001, no. 151; Artt. 112 ff., *Landsbesluit toezicht luchtvaart*. Art 78(2.a), *Landsbesluit toezicht luchtvaart*, moreover limits the categories of aircraft eligible to conduct such ‘commercial air traffic.’

⁵⁵ Cf. Art 1(o), *Luchtvaartlandsverordening*; Artt. 1 (gg), 15, *Landsbesluit toezicht luchtvaart*. SXC flights would fit here easily only in as far as flying ‘space tourists’ would be concerned, but it should be noted that SXC also intends to offer capacity for scientific experiments and training astronauts.

⁵⁶ Cf. Sec. 8.1.1.2(1), Civil Aviation Regulations Netherlands Antilles, Part 8, Aircraft Operations; P.B. 2008, no. 22.

⁵⁷ Cf. Art. 14(1), *Luchtvaartlandsverordening*.

⁵⁸ EASA was established by the Regulation of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, No. 1592/2002/EC, of 15 July 2002: OJ L 240/1 (2002); later amended by Regulation of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC, No. 216/2008/EC, of 20 February 2008: OJ L 79/1 (2008).

⁵⁹ See in particular Marciacq, 1–18.

⁶⁰ ICAO was established by the Chicago Convention, notably Artt. 43–90, to develop an international regime for the safety of aviation, essentially through the development of many SARPs. See also Van Fenema, 396, 400–3.

⁶¹ See Working Paper on Concept of Suborbital Flights, ICAO Council, 175th Session, 30 May 2005, C-WP/12436.

experience.⁶² As a consequence being left without ICAO guidance at a global level, individual states respectively EASA for the European Union would be left to their own devices in developing such rules, regulations and standards, causing already 'disharmonization' by the mere fact of diverging fundamentally from the US approach.

This is not to deny the value of using aviation and air law expertise, just to caution that its use without further ado should be strictly, consciously and explicitly limited to where it would be sensible, necessary and workable. The main area where this would currently seem to be the case would be criminal air law, since for example addressing the issue of contractual liability towards passengers has meanwhile taken a different direction—following by and large a high-risk adventure tourism approach.

4. High-Risk Adventure Tourism Law and Private Human Spaceflight

Again different in character from the two other branches of law discussed in this paper, high-risk adventure tourism law—or for that matter tourism law in general—hardly knows any international regime. Whilst a World Tourism Organisation (UNWTO) has been established in 1975,⁶³ it does not provide for any harmonization or requirement for national legislation along the lines of for example the Outer Space Treaty, the Liability Convention, the Chicago Convention or the Montreal Convention.⁶⁴ The result is, obviously, a widely varying array of national regimes generally applicable to tourist activities in the country at issue.

Only in Europe some efforts have been made at an international level to contribute to the establishment of a level playing field, an Internal Market for tourism, by way of applying at least general consumer rights and related liability questions in the context of tourist activities in a harmonized fashion throughout the then-Community, now Union.⁶⁵ At the same time, it should be noted that the Treaty of

Lisbon,⁶⁶ whilst allowing for a 'space competence' for the European Union, does expressly prohibit relevant follow-on EU legislative or regulatory activities to result in "any [obligation of] harmonization of the laws and regulations of the Member States."⁶⁷ This should caution anyone in assuming that specific EU competences in areas which may impact space tourism would automatically apply (or could readily be made to apply) to space tourism as such and/or other forms of private human spaceflight.

On the other hand, it *could* be argued that in the absence of any national "laws and regulations of the Member States" *specifically* addressing private human spaceflight (as analyzed before, only the United States has achieved such a feat in any appreciable detail) the prerequisite for the prohibition of EU legislative action of a harmonizing character does not exist in this special context. Thus, similarly to the area of satellite communications where since 1994 a harmonized EU Internal Market began to be developed,⁶⁸ some legislative action of the EU institutions could after all become warranted, in conformity with the key EU principles of 'subsidiarity' and 'proportionality'⁶⁹ and linking to the (limited) harmonization already being undertaken in the general tourism consumer context referred to.

The main contribution of tourism law to the future development of a special regime for private human spaceflight, whether nationally or internationally, may well lie in the concept of 'informed consent' and closely related liability waivers and disclaimers, which—with some variations—can be found in many national jurisdictions when it comes to handling such (other) high-risk adventure tourist activities as bungee jumping, helicopter-skiing, survalling and suchlike.⁷⁰

The United States has used precisely this concept in the context of private human spaceflight, as the regime developed

⁶² Cf., from this perspective, the findings of the US Congress that "space transportation is inherently risky, and the future of the commercial human space flight industry will depend on its ability to continually improve its safety performance" (Sec. 50905(1)(12), 51 U.S.C. Chapter 509) and that "the regulatory standards governing human space flight must evolve as the industry matures so that regulations [do not] stifle technology development" (Sec. 50905(1)(15), 51 U.S.C. Chapter 509).

⁶³ As per Statutes of the World Tourism Organization, Mexico City, done 27 September 1970, entered into force 2 January 1975; <http://unwto.org/sites/all/files/docpdf/unwto statutes eng.pdf>.

⁶⁴ Cf. e.g. http://en.wikipedia.org/wiki/World_Tourism_Organization.

⁶⁵ See e.g. Council Directive on unfair terms in consumer contracts, 93/13/EEC, of 5 April 1993; OJ L 95/29 (1993); Directive of the European Parliament and of the Council concerning unfair business-to-consumer commercial practices in the internal market and amending Council Directive 84/450/EEC, Directives 97/7/EC, 98/27/EC and 2002/65/EC of the European Parliament and of the Council and Regulation (EC) No 2006/2004 of the European Parliament and of the Council ('Unfair Commercial Practices Directive'), 2005/29/EC, of 11 May 2005; OJ L 149/22 (2005); and Council Directive on package travel, package holidays and package tours, 90/314/EEC, of 13 June 1990; OJ L 158/59 (1990). See e.g. O'Brien, Consumer Protection, 229-39; O'Brien, Advertising, 49-59.

⁶⁶ Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community (Treaty of Lisbon), Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 306/1 (2007).

⁶⁷ Art. 2, sub § 142(2), Treaty of Lisbon. See further e.g. B. Schmidt-Tedd, Authorisation of Space Activities after the Entry into Force of the EU Reform Treaty, in F.G. von der Dunk (Ed.), *National Space Legislation in Europe* (2011), 300-6; L. Mantl, The European Union, in C. Brunner & A. Soucek (Eds.), *Outer Space in Society, Politics and Law* (2011), 412-6; L.J. Smith, EU Competition Law and Issues of National Authorisation of Private Space Activities, in F.G. von der Dunk (Ed.), *National Space Legislation in Europe* (2011), 325-31.

⁶⁸ This process started with the enunciation of Commission Directive amending Directive 88/301/EEC and Directive 90/388/EEC in particular with regard to satellite communications, 94/46/EC, of 13 October 1994; OJ L 268/15 (1994); which over the years has been followed by an array of further Directives, Regulations and Decisions increasingly refining the general regime provided by the 1994 Directive. See already Von der Dunk Private Enterprise, 268-74; further e.g. P. Achilleas & R. Loubeyre, Regulatory Framework for Authorising Satellite Applications: The Case of Telecommunications, in L.J. Smith & I. Baumann (Eds.), *Contracting for Space* (2011), 102 ff.

⁶⁹ See Art. 5, Treaty on European Union as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 115/1 (2009).

⁷⁰ See Knutson, 105-22; Chatzipanagiotis, 105 ff.; also R. Yates, Minimizing Regulation of Space Tourism to Stimulate Commercial, Private Launch Capabilities, in *Proceedings of the Forty-Ninth Colloquium on the Law of Outer Space* (2007), 61 ff.

under the 2004 Commercial Space Launch Amendments Act allows operators for the time being to offer their flights to the public on the condition of such informed consent being given,⁷¹ thereby effectively denying contractual liability⁷² – in stark contrast to the relevant air law regime.

The details of such informed consent may as of yet not have been fully elaborated, but any major gaps are likely to be filled once the first licenses for passengers flights will begin to actually be issued.⁷³ Also, only after the first private sub-orbital spaceflights would take to the skies and the first unfortunate incidents or accidents would have happened, would the true value of such ‘informed consent-based waivers of liability’ be tested in the courts – what level of negligence, gross negligence or wilful misconduct could these ‘waivers’ fend off?⁷⁴ It is here, in particular, that high-risk adventure tourism may provide interesting pointers, or even precedents, for legal disputes regarding such passenger liability issues as these questions have indeed arisen in legal disputes concerning accidents in other high-risk adventure tourism contexts.

It is also here in particular that the individual US states having enunciated their own statutes, as referred to before, have made their impact, having have enacted legislation which further tries to limit possibilities for claimants to circumvent the ‘informed consent’ and waiver of liability at stake. Thus, under the Florida Statute, the warning statement part of the ‘informed consent’ requirement reads that “[u]nder Florida law, there is no liability for an injury to or death of a participant in a spaceflight activity,” and “[y]ou are assuming the risk of participating in this spaceflight activity.”⁷⁵

In the case of New Mexico, the model statement on behalf of a passenger *inter alia* reads: “3. I therefore understand, acknowledge and agree that I am waiving all claims” with respects to risks following from participating in the spaceflight.⁷⁶ For Texas, the text essentially results in the same waiver of liability: “I understand and acknowledge that a space flight entity is not liable” for any relevant injury.⁷⁷ Finally, the Virginia code also refers to lack of “civil liability” in these contexts.⁷⁸

⁷¹ See Sec. 70105(b)(5), Commercial Space Launch Act, *juncto* 14 C.F.R. § 460.45.

⁷² Licensed private human spaceflight operators are effectively at liberty to require space flight participants to sign waivers of liability before allowing them to fly, or could use defenses such as *volenti non fit injuria* against relevant liability claims in judicial proceedings. See Chatzipanagiotis, 110-2.

⁷³ Some general requirements with respect to ‘informed consent’ actually have already been provided by the FAA Human Space Flight Requirements: known hazards and risks must be made clear to spaceflight participants, they must be made aware that serious damage and injury, even death may occur and that the US government has not certified the vehicle concerned as safe for manned flights, records must be provided to the spaceflight participants of all manned launch and reentry vehicles of a US nature and the safety record of the particular vehicle at issue must include the number of flights conducted with it, the number of launch and re-entry accidents and incidents both on the ground and in night, as well as finally whether any corrective actions have been taken in this regard (see 14 C.F.R. § 460.45(a), (b), (c), (d)).

⁷⁴ See also e.g. Chatzipanagiotis, esp. 111-2.

⁷⁵ Florida Statute § 331.501 (2009).

⁷⁶ Space Flight Informed Consent Act, SB 009/2011).

⁷⁷ Title 4, Chapter 100A, Texas Civil Practice and Remedies Code.

⁷⁸ Virginia Code § 8.01227.8, 227.9, 227.10.

Also, this means that any application of the air law regimes on contractual liability, at least for the time being, would only seem to further complicate matters, by interfering with the application of the ‘informed consent-based waivers.’ It is true that this may currently be the case formally only in the United States. However, that state is also the only state so far having undertaken legislative and regulatory efforts specifically targeting private human spaceflight, is involved in most of the advanced projects regarding private human spaceflight, and finds at least some of the other countries involved tending to follow its example in this respect.

5. Concluding Remarks: Towards a Coherent, Consistent and Comprehensive Legal Framework for Private Human Spaceflight?

One of the overriding issues concerning private human spaceflight concerns how to properly regulate this specific new type of activity: part spaceflight, part aircraft operation and part high-risk adventure tourism (at least for the time being). All three existing sectors to a certain extent enjoy their specialized legal regimes, each of which has its relevance for private human spaceflight and is therefore currently being eyed as providing illustrations, analogies or even examples, of what the ultimate regime for private human spaceflight should look like—or being subjected to more straightforward efforts to simply determine them to be applicable.

On the international level, so far the International Civil Aviation Organisation has paid at least some attention to the need to appropriately regulate private human spaceflight, in contrast to the United Nations Committee on the Peaceful Uses of Outer Space – partly, because the latter has never been able to arrive at a widely accepted definition of ‘outer space’ and its lower boundary.

True, COPUOS has first addressed the issue somewhat tangentially, by having sent to all member states a questionnaire on the issue of definitions and applicable legal regimes for ‘aerospace objects,’ hybrid objects which could fly both in airspace and in outer space, in 1995.⁷⁹ That questionnaire, however, resulted in more questions and divergences of opinion than answers or common views, and could therefore be of little guidance regarding the present discussion. Secondly, it had then also drafted a questionnaire on the issue of the definition and delimitation of outer space, in 2006 as augmented in 2010.⁸⁰ Here, however, it is yet too early to draw any fundamental conclusions from the answers to this questionnaire.

At the same time, the United States, being furthest on the road to regulate private human spaceflight, does so largely in the framework of its commercial *space* launch acts, with the key licensing competencies resting with the Associate Administrator for Commercial Space Transportation – which

⁷⁹ Questionnaire on possible legal issues with regard to aerospace objects, (A/AC105/C2/1995/CRP.3), based on a Russian working paper presented in 1992 (A/AC.105/C.2/ L.189). See also further F.G. von der Dunk, Passing the Buck to Rogers International Liability Issues in Private Spaceflight, 86 *Nebraska Law Review* (2007), 425.

⁸⁰ See e.g. Questions on the definition and delimitation of outer space: replies from Member States, Note by the Secretariat (A/AC105/889/Add.10), of 21 February 2012, § 1.1 & 2.

is, to be even-handed, part of the Federal *Aviation* Administration. Certification, so crucial to the safety in the aviation sector, is for the time being essentially arranged on a voluntary basis, so that the concept of 'informed consent' with an accompanying *de facto* waiver of liability, well known in the area of high-risk *tourism*, rules supreme in balancing the interests in safety with those in stimulating an infant industry.

In Europe, again, it is currently only the European *Aviation* Safety Agency which has studied to some extent the possible approaches to certification of vehicles to be used for private human spaceflight—on the international level, that is. On a national level, in the United Kingdom any possible plans to start launching such flights from Scotland would currently be considered to fall within the scope of the UK *Outer Space* Act, whereas even more specifically in the case of the Dutch national *space* act its potential application to (the organization of) tourist flights was—and still is—an issue. Sweden effectively seems to vacillate between using an aviation approach following FASA's lead and using the US approach—essentially a space activity-*cum*high adventure tourism approach—in order not to unduly stifle Virgin Galactic's plans to fly from Spaceport Sweden.

In sum: a bewildering array of various legal regimes are currently being discussed as either already applicable, in whole or in part, to certain elements or aspects of private human spaceflight, or to *be* applied thereto. Obviously, the overarching requirements for any legal framework to be developed dealing with the particulars of this new category of highly technological, costly and risky activities, both nationally and internationally, should be coherence, consistency and as much as possible comprehensiveness—next to transparency, logic and fairness towards the industry, to consumers and to the third-party general public. What is necessary, consequently, is an integrated approach to start with.

At a second level, if the nascent private human spaceflight industry is to be stimulated in view of the technological, operational and financial breakthroughs it is expected to gen-

erate, any overregulation should be avoided. As long as the general public interests in a fair and appropriate third-party liability regime, environmentally benign operations and the peaceful character of all activities concerned are sufficiently safeguarded, one should err on the side of under-regulation, regulating only that which unquestionably both *can* and *needs* to be regulated in precise terms. This should be the ultimate outcome of the integrated approach.

This means, in an ironic twist of history, that to develop a legal framework allowing the infant space industry to mature in the same manner as the infant aviation industry was allowed to mature a century ago, space law and not air law should provide the baseline approach, both nationally and internationally. At least, that should be the case until private human spaceflights would become more akin to present-day aviation in routinely transporting passengers and cargo from one part of the globe to another. Air law has come a long way since those early days, and precisely for that reason may at first result in more obstacles than support and guidance for development of a legal framework appropriate from this perspective.

In so applying a 'space law approach,' its own current lack of accommodation of private *manned* spaceflight as well as its lack of any relevant internationally harmonized regulation vis-à-vis private manned spaceflight should be acknowledged, and it should be recognized that many other issues need to be resolved as well. 'Space law' should then borrow from high-risk adventure tourism, and integrate the 'informed consent-*cum*-waiver of liability' approach and experience, and borrow from air law only those particular and accurately applicable elements complying with the double criterion of being both possible and necessary to be regulated in precise terms—currently, it seems this only would apply to the criminal air law regime. Such an integrated approach would offer the best balance between the general public interests in safe, environmentally benign and peaceful space activities and the interests of an infant industry yet to take off.