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## Passing the Buck to Rogers: International Liability Issues in Private Spaceflight

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# Passing the Buck to Rogers: International Liability Issues in Private Spaceflight

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## I. INTRODUCTION

One of the most exciting recent developments in outer space, especially from a legal standpoint, is the advent of space tourism. Within the legal issues surrounding that development, liability is of prime importance.

Liability is, of course, always about “passing the buck,” or, more precisely, about who should pay compensation for damage caused by the activities concerned. At both the international level and in the field of space law, however, a large measure of confusion has often arisen as to the scope, meaning, and consequences of liability. This confusion is partly the consequence of liability’s intricate relationship to the concept of “[state] responsibility,”<sup>1</sup> where Article VI of the Outer Space Treaty<sup>2</sup> has applied this concept to the specific context of outer space and space activities. Further confusion results from the fact that liability itself is a concept and a term used in numerous national as well as international legal regimes, but may have different interpretations and applications in the separate contexts.

Thus, space law liability, especially of the international brand, which is the core subject of this Article, depends upon a specific legal regime, the boundaries of which will depend on questions such as: *where* does liability apply, *who* is a potential claimant, *who* is potentially liable, *what* type of liability is provided, *how* will compensation be distributed, etc.

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1. Frans G. von der Dunk, *Liability versus Responsibility in Space Law: Misconception or Misconstruction?*, 1991 PROCEEDINGS OF THE THIRTY-FOURTH COLLOQUIUM ON THE LAW OF OUTER SPACE 363, 363–71.

2. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. 6, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter “Outer Space Treaty”].

As will be seen, liability issues in this specific field are very much about “passing the buck” to those daring individuals who are trying to make space tourism and private spaceflight actually happen—to the Buck Rogerses of real life.

## II. “PRIVATE SPACEFLIGHT” VERSUS “SPACE TOURISM”

A few introductory points should be briefly discussed here concerning the terminology that will be used. While many of these issues have been brought to the attention of the public essentially under the heading of “space tourism,” the term “private spaceflight” will be used in this article as the main captive label for the activities under consideration.

“Space tourism” has been defined as “any commercial activity offering customers direct or indirect experience with space travel.”<sup>3</sup> The “official” definition of tourism offered by the World Tourist Organization (“WTO”) and the U.N. Statistical Committee in 1994 reads: “The activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure . . . .”<sup>4</sup> Tourism, hence, requires the availability of three distinct elements:

- (1) a discretionary income available for leisure travel; (2) ample leisure time to spend on both preparations for and taking the trips themselves; and (3) an infrastructure supporting tourism that offers accommodations, food and amenities, transportation systems, and attractions to see and do at the place visited.<sup>5</sup>

For one part, the above definition of *space* tourism encompasses “indirect experience,” which refers to activities such as parabolic flights for the sake of enjoying a few seconds of weightlessness—considered the ultimate “space experience.” However while these flights come close to the edge of outer space, they never *enter* outer space.<sup>6</sup>

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3. Stephan Hobe & Jürgen Cloppenburg, *Towards a New Aerospace Convention?: Selected Legal Issues of “Space Tourism”*, 2004 PROCEEDINGS OF THE FORTY-SEVENTH COLLOQUIUM ON THE LAW OF OUTER SPACE 377, at 377; see Steven Freeland, *The Impact of Space Tourism on the International Law of Outer Space*, PROCEEDINGS OF THE FORTY-EIGHTH COLLOQUIUM ON THE LAW OF OUTER SPACE 178, at 179.
  4. Roger D. Launius & Dennis R. Jenkins, *Is it Finally Time for Space Tourism?*, 4 ASTROPOLITICS 253, 255 (2006). Actually, after “for leisure,” the definition of tourism adds “business, and other purposes,” but this is a strange, complicated, and counter-intuitive addition, ultimately to be rejected since it would effectively equate “tourism” with *all* travel, which takes away any distinctive, common-sense meaning of the former phrase. Launius and Jenkins, in their extended historical expose, clearly do not refer to *all* travel, but merely to travel for purposes that everyone would agree constitute tourism, properly speaking.
  5. Launius & Jenkins, *supra* note 4, at 254.
  6. See John Loizou, *Turning space tourism into commercial reality*, 22 SPACE POLICY 289, 289 (2006); Lesley Jane Smith & Kay-Uwe Hörl, *Legal Parameters of Space Tourism*, 2004 PROCEEDINGS OF THE FORTY-SIXTH COLLOQUIUM ON THE LAW OF

Thus, from most angles indirect experiences such as parabolic flights do not legally encompass issues of space law.

For the other part, space tourism refers to the *reason* for private individuals to undertake the activity: the wish to enjoy space travel is not altogether a legally-decisive criterion. For instance, “typical” aircraft will carry both tourists (persons taking a flight because they love flying or want to spend their holidays away far from home) as well as passengers who merely need to go to another place for business reasons. Yet, legally speaking, all passengers on such a flight are equal in terms of aviation law—whether it concerns contractual liability, consumer rights, or the need to bring a valid passport.

Furthermore, it should be pointed out that Mr. Will Whitehorn, the CEO of Virgin Galactic (the company most likely to first start offering sub-orbital flights to tourists), has stated that the ultimate purpose of private spaceflight activity is not to undertake tourism, but to demonstrate the safety of the technology used.<sup>7</sup> This would enable companies to begin offering flights between various points on earth, where passengers will be solicited regardless of whether they want to fly that stretch for fun or for professional reasons.<sup>8</sup>

It is submitted, therefore, that “private spaceflight” is the more precise and more helpful term for the purpose of legal analysis. The level of private participation in these new types of space activities requires analysis and, likely, adaptation of the current legal environment for undertaking space activities, whether national or international.

### III. SURVEYING THE SCENE: FIVE TYPES OF PRIVATE SPACEFLIGHT

Having thus outlined the scope of the present article as focusing essentially on private spaceflight, whether at the service of tourists or otherwise, upon closer scrutiny, five distinct types of private participation in spaceflight may be discerned. These five types will each be slightly more elaborated upon as to their main technical, operational, and economic characteristics before the specific legal ramifications and parameters involved in those activities are discussed.

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OUTER SPACE 37, at 37; see *infra* Part VII.B. on the discussion of where outer space is supposed to begin.

7. See, e.g., Frans G. von der Dunk, *Report on the 2006 ECSL Practitioners' Forum*, 33 ECSL NEWS 3, 3 (2006).

8. *Id.* It may be further noted that Virgin Galactic is an off-spring of Virgin Atlantic, a British airline company providing air transportation between various points on earth.

## A. Orbital Space Tourism

The first type of private spaceflight, chronologically speaking, is that of “orbital space tourism.” Its immediate precursor dates back to 1990, when a Japanese journalist spent a week on the all-Russian space station Mir, followed the next year by an English engineer.<sup>9</sup> These two men, although neither were employees of the Russian Space Agency, were professionally-trained astronauts and were able to go to outer space as a spectacular consequence of their own—otherwise non-astronautic—professional assignments.

Regular space tourism took off only in April 2001, when U.S. citizen Dennis Tito was launched to the Russian part of the International Space Station (“ISS”) for no other reasons than that he desired to fly in outer space and that he had the money privately available to fulfil that desire.<sup>10</sup>

Originally, Tito—through the brokerage of a small, private company called MirCorp that was established specifically for bringing self-financed private persons into space—was supposed to be sent on a Russian launch vehicle to the Russian space station Mir. At the time, the overall price tag of Tito’s trip was estimated to be approximately \$20,000,000 U.S. In the course of his preparations, however, one incident too many befell Mir, and the space station had to be de-orbited over the Pacific Ocean in March 2001.<sup>11</sup> In order to honor their contractual commitment, the Russians had but one opportunity: change Tito’s destination to the Russian module of the ISS.

A second millionaire, South African Mark Shuttleworth, followed suit in 2002; U.S. national Greg Olsen became the third space tourist in 2005; and Anousheh Ansari became the first female space tourist in 2006.<sup>12</sup> At the time of writing, space tourist number five, Charles Simonyi, is the last on the list, having flown in April 2007,<sup>13</sup> but there are at least a handful more of people gearing up. In the meantime, MirCorp has been restructured and replaced in its particular role by

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9. See Sergei A. Negoda, *Legal Aspects of the Commercial Development of the Russian Segment of the ISS*, 28 AIR & SPACE LAW 89, 90–91 (2003).

10. See, e.g., Launius & Jenkins, *supra* note 4, at 260; Smith & Hörll, *supra* note 6, at 38.

11. See Linda Billings, *Exploration for the masses? Or joyrides for the ultra-rich? Prospects for space tourism*, 22 SPACE POLICY 162, 163 (2006); Rosanna Sattler, *U.S. Commercial Activities aboard the International Space Station*, 28 AIR & SPACE LAW 66, 81 (2003). Notably, Mir had been in operation for fifteen years at that point—three times its originally expected lifetime.

12. See Leonard David, *Space Adventures Sees Wide Range of Public Space Travel*, SPACE NEWS, July 23, 2007, at 12.

13. See David, *supra* note 12, at 12.

Space Adventures with the activities, legally speaking, being relocated from the Netherlands to the United States.<sup>14</sup>

## B. Sub-orbital Space Tourism

The second type of private spaceflight should be called “sub-orbital space tourism.” The International Civil Aviation Organization (“ICAO”) has defined “sub-orbital flight” as “a flight up to a very high altitude which does not involve sending the vehicle into orbit.”<sup>15</sup> The ICAO goes on to reference the definition of “sub-orbital trajectory” by applicable U.S. law as “the intentional flight path of a launch vehicle, re-entry vehicle, or any portion thereof, whose vacuum instantaneous impact point does not leave the surface of the earth.”<sup>16</sup> These definitions are vague as to the altitude, especially in determining whether outer space is reached. In contrast, a marginally more precise definition of “sub-orbital” effectively refers to “the launch of an object or objects into outer space without that object or such objects completing one or more orbits around the earth.”<sup>17</sup>

Sub-orbital space tourism was actually triggered by the Ansari X Prize competition, a prize in the aviation-pioneering-era style for a remarkable technological or operational feat. The Ansari family (of whom the first female space tourist is a prominent member), together with a few others, had offered a purse of \$10,000,000 U.S. in 1996 for the first completely privately funded reusable craft that could fly a pilot and two (dummy) persons twice within three weeks to an altitude of over 100 kilometers (claimed to constitute the edge of outer space).<sup>18</sup>

Shortly before the competition deadline, in October 2004, Burt Rutan’s small company, Scaled Composites, achieved the required feat and won the prize. His SpaceShipOne (“SS-1”) vehicle was carried by a small, almost equally exotic aircraft, the White Knight, to an altitude of 55,000 feet, where SS-1 separated to launch itself towards its ultimate altitude of 112 kilometers. Re-entry, including a few minutes of weightlessness, was not in a normal, fully-controlled mode, but rather was something like a sycamore leaf floating down. Once it was

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14. While Sattler still speaks about MirCorp and its role in bringing not only Tito, but also Shuttleworth, to the ISS and only refers to Space Adventures in a different context, all later authors simply refer to Space Adventures as being responsible for those as well as follow-up trips. Cf. Sattler, *supra* note 11, at 79–81, 79 n.63 with Billings, *supra*, note 11, at 163.

15. Peter van Fenema, *Suborbital Flights and ICAO*, 30 AIR & SPACE LAW 396, 405 (2005).

16. *Id.*

17. *Id.* at 396.

18. See, e.g., Gregg Maryniak, *When will we see a Golden Age of Spaceflight?*, 21 SPACE POLICY 111, 118 (2005); Billings, *supra* note 11, at 163.

back at 55,000 feet, the SS-1 finally transformed into a glider, descending pilot-controlled from there.<sup>19</sup>

Immediately after the SS-1 was launched, the Virgin Group billionaire entrepreneur Sir Richard Branson, who had been competing for the X Prize, established a company called Virgin Galactic, which in turn formed a joint venture with Rutan's Scaled Composites. The joint venture owned the intellectual property rights and licensed the technology to Virgin Galactic, the majority owner of the joint venture. Scaled Composites was the minority shareholder. This structure was chosen in order to avoid monopolizing access to the technology and foreclosing Virgin Galactic's use of other technology.<sup>20</sup>

Virgin Galactic soon announced plans to develop and build a SpaceShipTwo ("SS-2"), or, more precisely, five SS-2s, each a bigger version of SS-1 carried by a larger aircraft, using essentially the same SS-1 technology. By 2008 or 2009, Virgin Galactic is targeting to launch three flights per day, taking six passengers per spaceship to an altitude of some 120 kilometers and allowing them about five minutes of weightlessness, at a ticket price of \$200,000 U.S. per person.<sup>21</sup> Additional passengers would be able to witness from the carrier (a Boeing 757-like aircraft) the air-launch proper and the subsequent flight of the SS-2—obviously at a considerably lower price.<sup>22</sup> Contacts were quickly established with the New Mexico spaceport (now dubbed "Spaceport America") to allow Virgin Galactic's first number of flights to depart from there.<sup>23</sup>

Following the apparent preliminary success in drawing customers—at the European Centre for Space Law ("ECSL") March 2006 Practitioners' Forum in Paris, Whitehorn claimed to have some 43,000 bookings, with down-payments adding up to a total of \$13 million U.S. already deposited—Virgin Galactic recently negotiated a similar deal with the Swedish Space Corporation ("SSC") to turn the northerly launch site at Kiruna into "Spaceport Sweden," allowing passengers to experience the *Aurora Borealis* from the edge of outer space by 2012.<sup>24</sup> Other companies also started announcing similar plans. For instance, Space Adventures is discussing the possibility of establishing space-

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19. See, e.g., von der Dunk, *supra* note 7, at 2; Launius & Jenkins, *supra* note 4, at 254, 272; Loizou, *supra* note 6, at 289; Van Fenema, *supra* note 15, at 396, 405.

20. See Sylvia Ospina, *Lessons from "The Little Prince" on Space Flight*, PROCEEDINGS OF THE FORTY-EIGHTH COLLOQUIUM ON THE LAW OF OUTER SPACE 190, 191; von der Dunk, *supra* note 7, at 3.

21. See von der Dunk, *supra* note 7, at 3; Launius & Jenkins, *supra* note 4, at 272; Loizou, *supra* note 6, at 289; Van Fenema, *supra* note 15, at 396.

22. See von der Dunk, *supra* note 7, at 3.

23. See, e.g., Leonard David, *Challenges Ahead for Spaceport America*, SPACE NEWS, Oct. 23, 2006, at 4; Billings, *supra* note 11, at 163.

24. See, e.g., P.B. de Selding & Tariq Malik, *Virgin, Swedish Spaceport Sign Deal for Suborbital Flights*, SPACE NEWS, Feb. 5, 2007, at 11.



ports for these types of flights in Ras al Khaimah (United Arab Emirates) and Singapore.<sup>25</sup>

### C. Sub-orbital Private Spaceflight

The third type of private spaceflight, where the tag of “space tourism” would no longer convincingly stick, is that of “sub-orbital private spaceflight.” It emanates effectively from the second type of private spaceflight. As mentioned, the strategic idea behind the envisaged SS-2 flights was not so much to undertake space tourism, but to prove technology—and *then* to draw in required external financing for the next generation of private spaceflight vehicles. These third generation SS-3 vehicles are intended to offer flights from one point on earth to another or from earth to a specific destination in space and back. Ultimately perhaps, these trips may even include at least one full orbit, in which case, the latter type of spaceflight should, of course, be labeled “orbital private spaceflight.”<sup>26</sup>

This version of private spaceflight, however, would likely take the longest amount of time to achieve. Moreover, it would essentially amount to a fourth type of spaceflight, hotels in orbit, which will be discussed further later. As such, only the two other alternative versions (though one flight could very well serve both purposes at the same time) will be discussed here. On the one hand, it is in earth-to-earth transportation that this type of private spaceflight would come closest to aviation—transporting passengers and cargo between two distinct places on earth. On the other hand, it is in earth-to-space and space-to-earth transportation that this type of private spaceflight would become more akin to traditional human spaceflight, notably visiting space stations already in orbit.

While, perhaps wisely, no timeline is indicated as of yet for the SS-3 to be operational, a clue might be garnered from the remarks of Whitehorn at March 2006’s ECSL Practitioners’ Forum.<sup>27</sup> He professed that the main aim of SS-2, as a technology demonstrator, was to achieve a safety goal of accidents happening in no more than one in 50,000 flights. He indicated that such a safety-level would allow the company to move into sub-orbital spaceflight, as such a risk level is roughly the level applicable to air transport in the safer parts of the

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25. See Launius & Jenkins, *supra* note 4, at 254, 273; Billings, *supra* note 11, at 163; Loizou, *supra* note 6, at 290 (quoting a ticket price of \$102,000 U.S., while indicating passengers will remain strapped to their seats during the whole flight, missing out on the excitement of true weightlessness).

26. Whitehorn, at the ECSL Practitioners’ Forum, Mar. 17, 2006, 33 ECSL News 3, 3 (2006); see L. David, *Virgin Galactic Aims High with Commercial Space Flight Plans*, SPACE NEWS, Nov. 20, 2006, at 17.

27. See von der Dunk, *supra* note 7, at 2–3.

world.<sup>28</sup> He also claimed that Virgin Galactic intended to offer three flights a day. Based on those assumptions, and presuming that Virgin Galactic would actually start with SS-2 flights sometime in 2008, the 50,000 flight-threshold would be reached by 2050 or so at the earliest. Even presuming a massive and rapid increase of flights to twenty flights per day—requiring perhaps as many as twenty-five vehicles being operational at any time—this threshold would only be reached in approximately seven years.<sup>29</sup>

Because of its close relationship to the second type of “sub-orbital tourism” and its inherent characteristics, sub-orbital private spaceflight is going to be treated prior to the fourth type.

#### D. Hotels in Orbit

The fourth category of spaceflight to be addressed by this Article is that of “hotels in orbit.” As early as 1967, in the slipstream of the Apollo project reaching out to the Moon, the Hilton hotel chain professed an interest in developing proposals to launch and operate hotels in orbit, or even on the Moon.<sup>30</sup> More proposals have been tabled from time to time, although none of them went very far on the road to realization.<sup>31</sup>

Most recently, however, driven partly by the X Prize competition and its successful conclusion in 2004, Bigelow Aerospace has developed a serious project aiming to have a fully-equipped orbital hotel operational by 2015. The first major step, the launch of an inflatable unmanned module Genesis-I, already took place in July 2006 and is apparently such a success that the next step, sending up Genesis-II, a copy of Genesis-I carrying mementos for the public, took place ahead

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28. This figure should not be taken for granted, however; *cf. e.g.* Launius & Jenkins, *supra* note 4, at 268.

29. This is not meant to be a marketing study, but it is to be kept in mind that the SS-2 vehicles each should carry (a maximum of) six passengers on board. As observed, in March 2007 Whitehorn claimed 43,000 bookings, and the number has no doubt risen considerably since. At the same time, with an average five passengers per flight presumed, 50,000 flights still means 250,000 passengers willing to pay between \$50,000 U.S. (the price for a ticket Whitehorn estimated to be applicable towards the end of the 50,000-flight target period) and \$200,000 U.S. (the estimated price over the next few decades, or in the case of twenty flights per day the next seven or eight years). That seems to be a fairly ambitious target, especially taking into consideration that other companies will likely enter the business as well. It may also be noted that existing studies estimate there will be some 1,000 clients for sub-orbital private spaceflight in about five years from now. Loizou, *supra* note 6, at 289. For a relatively early market overview, see Patrick Collins, *Meeting the Needs of the New Millennium: Passenger Space Travel and World Economic Growth*, 18 SPACE POLICY 183, 183–97 (2002).

30. See Billings, *supra* note 11, at 162; Launius & Jenkins, *supra* note 4, at 261.

31. See, *e.g.*, Billings, *supra* note 11, at 163 (concerning Spacehab in 1999).

of the original planning in June 2007.<sup>32</sup> The third step would then be to launch a mock-up version of the ultimate hotel, called Sundancer, by 2012.<sup>33</sup>

Following the lead of the X Prize, in order to enhance the possibilities for actually achieving the orbital hotel-to-be, Bigelow Aerospace dedicated a prize of \$50,000,000 U.S. for the first fully privately-funded orbital space vehicle.<sup>34</sup>

### E. Private Flights to the Moon

For completeness' sake, a fifth possible type of private spaceflight may be mentioned: the one which will have the Moon for a target. Private flights to the moon, however, do not seem to be imminently feasible. The challenges of getting to the Moon are daunting enough for the space agency that has been able to bring twelve men out there and back, the U.S. National Aeronautics and Space Agency ("NASA"). To expect a private effort at manned spaceflight in that direction, whether for tourist purposes or otherwise, within the next few decades, might be somewhat unrealistic.

Moreover, flights to the Moon entail an additional set of legal, political, and commercial issues. These challenges relate, among other things, to the absence of immovable property rights on celestial bodies such as the Moon<sup>35</sup> and to the existence of and widespread lack of adherence to<sup>36</sup> a special international treaty relevant to the special status of the Moon and other celestial bodies, the Moon Agreement.<sup>37</sup>

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32. Leonard David & Tariq Malik, *Bigelow Successfully Launches Second Module into Orbit*, SPACE NEWS, July 2, 2007, at 5. See, e.g., Leonard David, *Genesis 1 Success Advances Bigelow's Planning*, SPACE NEWS, Nov. 27, 2006, at 4; *Bigelow Launches Its First Inflatable Module*, SPACE NEWS, July 17, 2006, at 3; Leonard David, *FAA Issues license for Bigelow Space Modules*, SPACE NEWS, Nov. 29, 2004, at 16; CNN.com, *Spacecraft carrying commercial space station launches*, Science & Space, July 12, 2006. Bigelow took his first steps to obtain a license already in 2001. Sattler, *supra* note 11, at 68 n. 13.
  33. See, e.g., *Bigelow Plans to Launch Human-Rated Space Habitat by 2010*, SPACE NEWS, Sept. 25, 2006, at 6; CNN.com, *Spacecraft carrying commercial space station launches*, Science & Space, July 12, 2006.
  34. For more information see in particular Bigelow Aerospace, America's Space Prize, [http://www.bigelow-aerospace.com/multiverse/space\\_prize.php](http://www.bigelow-aerospace.com/multiverse/space_prize.php) (last visited July 8, 2007); Ospina, *supra* note 20, at 191.
  35. See, e.g., Patricia M. Sterns & Leslie I. Tennen, *Private Enterprise and the Resources of Outer Space*, 2005 PROCEEDINGS OF THE FORTY-EIGHTH COLLOQUIUM ON THE LAW OF OUTER SPACE 240, 241-52; Frans G. von der Dunk, E. Back-Implomeni, S. Hobe & R.M. Ramirez de Arellano, *Surreal estate: addressing the issue of 'Immovable Property Rights on the Moon'*, 20 SPACE POLICY 149, 149-56 (2004).
  36. See, e.g., INTERNATIONAL AND INTERDISCIPLINARY WORKSHOP ON POLICY AND LAW RELATING TO OUTER SPACE RESOURCES: THE EXAMPLE OF THE MOON, MARS & OTHER CELESTIAL BODIES 17-23 (2006).
  37. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 18 U.S.T. 2410, 1363 U.N.T.S. 3.

For those reasons, private flights to the moon may be safely left out of the discussion for the time being.

#### IV. THE LIABILITY CONVENTION

When liability in terms of space activities is to be addressed, the point of departure should always be the Liability Convention.<sup>38</sup> Though to different extents both *de jure* and *de facto*, the Liability Convention *will* apply to all four types of private spaceflight to be discussed. Hence, it is helpful to first look at the Liability Convention as it stands and to outline its major purposes, elements, and clauses.

##### A. The System of State Liability under the Liability Convention

Most importantly, the Liability Convention is effectively an elaboration of Article VII of the Outer Space Treaty<sup>39</sup> and is based on the (rather unique) premise of state liability.<sup>40</sup> As a consequence of this Article and the Liability Convention itself, a state is internationally liable for any damage caused by a space object, regardless of whether it may be owned, operated, launched, or paid for even by a private entity, *as long as that state qualifies as "launching state" of the space object concerned*. Such a definition is formally provided by the Liability Convention as follows: "The term 'launching State' means: (i) A State which launches or procures the launching of a space object; (ii) A State from whose territory or facility a space object is launched."<sup>41</sup> While this definition seemingly leads to a clear picture of which states are liable, once it comes to the allocation of liability in the context of

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38. Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter "Liability Convention"].

39. Outer Space Treaty, *supra* note 2, art. VII reads in full: "Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies."

40. The major other examples of treaties specifically imposing state liability, also in cases of essentially private activities, concern a handful of international agreements on dealing with nuclear and oil pollution, such as the Convention on Third Party Liability in the Field of Nuclear Energy, July 29, 1960, 956 U.N.T.S. 251; Convention on the Liability of Operators of Nuclear Ships, Brussels, done 25 July 1962, not yet entered into force; 57 A.J.I.L. 268 (1963); Vienna Convention on Civil Liability for Nuclear Damage, May 21, 1963, 1063 U.N.T.S. 265; International Convention on Civil Liability for Oil Pollution Damage, Nov. 29, 1969, 973 U.N.T.S. 3; and International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, Dec. 18, 1971, 1110 U.N.T.S. 57.

41. Liability Convention, *supra* note 38, art. I(c).

private involvement, the issue, upon closer examination, is not so simple.

If Article I(c) of the Liability Convention provides that the first way in which a state can be qualified as a "launching state" will be when the *state* "launches" the space object concerned, what if a private launch operator is undertaking the launch? Does this make the state of nationality or registration of the private launch operator liable under this criterion, or is there no *state* which can be held liable under this criterion, since no *state* "launches" in the proper sense of the word?

Similar uncertainties apply with respect to the second criterion, that of a state "that procures the launching," and the third criterion, that of a state "whose facility" is used for the launch. What if the launch customer is a private company, for example a satellite communications company, or if the spaceport from which the launch occurs is owned and operated by a private company, as is currently the case in a handful of instances within the United States?

The one criterion so far not discussed concerns the state "whose territory" is used for the launch. Having "territory" in the international legal sense of the word is something exclusively reserved for states. Though of a different nature, an important question arises here as well—what if the launching takes place outside the territory of any state, as has now repeatedly occurred with launches conducted by the private consortium Sea Launch from its launch platform that is towed out to the high seas prior to launch?<sup>42</sup> Suffice it to say for the purpose of the present analysis, that no private spaceflight is likely to be conducted from the high seas for the time to come, but this may change.

Ultimately, the state liability which arises under the Liability Convention, to some extent regardless of its precise allocation in the case of private operators as discussed above, leads concerned states to exercise their national jurisdiction to control private spaceflight in an effort to guard against liability and any obligation to pay for the damage caused.

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42. It should be reiterated that the high seas fundamentally fall outside the territorial jurisdiction of any state; *cf.* Convention on the High Seas art. 2, Apr. 29, 1958, 13 U.S.T. 2312; 450 U.N.T.S. 82, with United Nations Convention on the Law of the Sea art. 87, 89, Dec. 10, 1982, 1833 U.N.T.S. 3, 1835 U.N.T.S. 26. See also Arnel Kerrest, *The Launch of Spacecraft from the Sea*, in *OUTLOOK ON SPACE LAW OVER THE NEXT 30 YEARS* 217, 225–33 (Gabriel Lafferranderie & Dapné Crowther eds., 1997); Arnel Kerrest, *Launching Spacecraft from the Sea and the Outer Space Treaty: The Sea Launch Project*, 1997 PROCEEDINGS OF THE FORTIETH COLLOQUIUM ON THE LAW OF OUTER SPACE, 264, 265–68; H.L. van Traa-Engelman, *Commercial Utilization of Outer Space* (1993), 45–46 (arguing that "facility" as a criterion for liability for the purpose of the Liability Convention amounts to quasi-territoriality).

## B. The Main Elements of the Liability Convention's Regime

The Liability Convention, though not referring anywhere explicitly to the concept, only deals with third-party liability.<sup>43</sup> Most clearly, this third-party liability arises from clauses referring to cases involving more than one state in the causation of damage, where only the inter-party distribution of third-party liability was referred to, which depending upon the case was then explicitly or implicitly left for those states to address.<sup>44</sup> Finally, Article VII of the Liability Convention excludes "foreign nationals . . . participating in the launch" from the scope of the Convention in case they suffer damage caused by the space object launched.<sup>45</sup>

Next, the Liability Convention only deals with third-party liability to the extent it is international in character. Article VII specifically excludes claims against a launching state relating to damage suffered by nationals of that launching state;<sup>46</sup> any such claims are considered a matter of relevant national law and not to require any measure of international "harmonization" or treaty-obligations resting upon the state(s) concerned.

Two types of liability are then applied by the Convention. On the one hand, when it comes to damage caused on earth or to aircraft in flight, absolute liability applies—that is, the mere establishment of the causal link between the damage and the space object and the identification of the launching state(s) of the latter suffices for liability to arise.<sup>47</sup> Only where the victims have somehow substantially "contributed" to the occurrence of their own damage, for example by ignoring warnings that a satellite might re-enter into a certain airspace and not keeping aircraft out of the area, could the absolute character of the liability be taken away.<sup>48</sup>

On the other hand, when it comes to damage caused to other space objects in outer space, fault liability applies.<sup>49</sup> This already raises, at least in theory, the question of where outer space begins; this issue is

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43. See, e.g., Liability Convention, *supra* note 38, art. III (referring to damage done to the space object of another state).

44. See Liability Convention, *supra* note 38, art. V(2).

45. Liability Convention, *supra* note 38, art. VII; see, e.g., Hobe & Cloppenburg, *supra* note 3, at 380.

46. Liability Convention, *supra* note 38, art. VII.

47. See Liability Convention, *supra* note 38, art. II; see also Liability Convention, *supra* note 38, art. IV(1)(a) (applying absolute liability also in cases where two or more launching states are jointly causing damage on earth).

48. See Liability Convention, *supra* note 38, art. VI(1) (speaking of "gross negligence or . . . an act or omission done with intent to cause damage").

49. See Liability Convention, *supra* note 38, art. III; see also Liability Convention, *supra* note 38, art. IV(1)(b) (applying fault liability also in cases where two or more launching states are jointly causing damage to a third-party space object).

touched upon below in somewhat greater detail.<sup>50</sup> Whether absolute or fault liability applies, the Liability Convention does not provide any limit to the compensation due.<sup>51</sup>

Other important provisions of the Liability Convention are worthy of brief mention here. First, the dispute settlement system will result in a binding solution only if both parties have agreed in advance.<sup>52</sup> International claims under the Liability Convention neither require the exhaustion of local remedies nor stand in the way of private claims in the court of a launching state.<sup>53</sup> Finally, private parties do not have a claim under the Liability Convention—only specific categories of state claimants may bring a claim.<sup>54</sup>

The Liability Convention, drafted in 1972, as of January 1, 2006, is in force for eighty-three states and three intergovernmental organizations,<sup>55</sup> with twenty-five states acting as signatories.<sup>56</sup>

## V. LIABILITY ISSUES IN ORBITAL SPACE TOURISM

The new phenomenon of orbital space tourism, as it kicked off with Tito's flight to the International Space Station, generated a number of new legal and specific liability issues, limited in scope as they might have seemed. While these issues were still about public spacecraft—both the spacecraft flying to the ISS, which were Russian Soyuz vehicles launched from Bajkonur, Kazakhstan, and the ISS itself—they also regarded private persons orbiting as tourists instead of profes-

50. See *infra*, Part VII.B.

51. Cf. Liability Convention, *supra* note 38, art. XII, which provides in full:

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.

52. See Liability Convention, *supra* note 38, art. XIX(2); see generally Liability Convention, *supra* note 38, arts. XIV-XX.

53. Liability Convention, *supra* note 38, art. XI(1).

54. Liability Convention, *supra* note 38, art. VII (giving primary rights of claim to the state whose nationals have suffered damage, a secondary right to the state whose permanent residents suffered the damage, and a tertiary right for the state on whose territory the damage was sustained and explaining that private parties have no right of recourse under the Liability Convention); see Freeland, *supra* note 3, at 183.

55. United Nations Office for Outer Space Affairs, Convention on International Liability for Damage Caused by Space Objects (2006), <http://www.unoosa.org/oosa/SpaceLaw/liability.html>. All the important space-faring nations are included among the parties to the Liability Convention.

56. In accordance with the Vienna Convention on the Law of Treaties, art. 18(a), May 23, 1969, 1155 U.N.T.S. 331, signature by a state of a treaty brings with it a fundamental duty not to defeat object and purpose of the treaty prior to its ratification by that state.

sionals working in space. There also was a limited (but crucial) role for a private “broker:” MirCorp, now known as Space Adventures.<sup>57</sup>

### A. The Liability Convention and Orbital Space Tourism

Looking at the Liability Convention first, it is immediately clear how a state’s liability is affected by the novel development of private spaceflights. Through the definition of the “launching state,” in Article I(c) of the Liability Convention, the need arises for the licensing of any private operators whose actions might make the state liable on the international plane. Such licensing should specifically provide for relevant reimbursement obligations—to the extent the state is not willing to carry that burden itself.

Of course, this is why Russia, the state that launched the Soyuz that sent Tito to the space station from the Russian facility Bajkonur, took it upon itself to take out insurance in the case of Dennis Tito (costing \$ 100,000 U.S.),<sup>58</sup> since it could neither impose after the fact such an obligation upon MirCorp/Space Adventures, nor upon Tito. Had Russia been aware in advance, however, it could well have implemented a plan that would have required either the company or the tourist to reimburse the state through a license or even contractual agreements with the Russian Space Agency.<sup>59</sup> In future cases, this certainly remains a possibility—and obviously not only for Russia.

### B. The ISS Legal Framework and Orbital Space Tourism

As for international inter-party liability, one has to look to the legal framework underpinning the ISS, which is also a state-to-state affair, as the ISS has been a multiple-state undertaking from the beginning. For the purpose of the ISS, the United States, Canada, Japan, and eleven member states of the European Space Agency (“ESA”)<sup>60</sup> had concluded an international treaty in 1988,<sup>61</sup> which was

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57. See Smith & Hörl, *supra* note 6, at 38.

58. See G. Catalano Sgrosso, *Legal Aspects of the Astronaut in Extravehicular Activity and the “Space Tourist,”* Proceedings of the Symposium “Legal and Ethical Framework for Astronauts in Space Sojourns,” Paris, Oct. 29, 2004, co-organized by ECSL, ESA, IDEST (Institut du droit de l’espace et des télécommunications de l’Université de Paris XI), UNESCO, doc.SHS-2005/WS22, 57, 59.

59. It may be noted that the cross-waiver which the IGA, *see infra* note 62, provided for, while rather comprehensive in many other respects, *see infra* note 63, did not extend to “claims between a Partner State and its related entity or between its own related entities” under Art. 16(3.d), sub (1).

60. This concerned Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom. *See, e.g.*, Smith & Hörl, *supra* note 6, at 39.

61. Agreement Among the Government of the United States of America, Governments of Member States of the European Space Agency, the Government of Japan, and the Government of Canada on Cooperation in the Detailed Design,



renegotiated following the demise of the Soviet Union to allow the Russian Federation to join, leading to the currently applicable version of the Intergovernmental Agreement (“IGA”) in 1998.<sup>62</sup>

Logically following from the public character of the IGA, the question of any damage sustained in the course of ISS-related activities was regulated principally at the state-to-state level, though with far-reaching flow-down provisions to ensure the space agencies, contractors, and sub-contractors involved under the guidance of the states would abide by the liability regime as well. That liability regime actually provided for a quite far-reaching cross-waiver of liability, as between all the states and their agencies, contractors, sub-contractors, and anyone else involved in the chain of developing, building, launching, and operating the space station.<sup>63</sup>

For understandable reasons, there is no arrangement in the context of ISS activities (or more generally in human spaceflight so far) for something which might be called “personal” liability. Up to this time, all persons having entered outer space were astronauts, cosmonauts, or taikonauts, highly-trained employees of governmental space agencies, whose presence in outer space was primarily or exclusively for professional reasons. This meant that any issues of such persons causing damage and raising questions of liability were dealt with in the context of their professional employment, with any “personal” liability likely being waived absent gross negligence or disregard of orders.

In the case of Tito, in spite of the fact that he was not a professional under contract with the Russian Space Agency or the Russian government, the result of the ISS regime on liability—its comprehensive mandatory cross-waiver—was that the United States<sup>64</sup> might

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Development, Operation, and Utilization of the Permanently Manned Civil Space Station, Sept. 29, 1988, in *Space Law—Basic Legal Documents*, § D.II.4.2 (Karl-Heinz Bockstiegel & Marietta Benko eds., 1995).

62. Agreement among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America concerning Cooperation on the Civil International Space Station, Jan. 29, 1998, in *Space Law—Basic Legal Documents*, § D.II.4 (Karl-Heinz Bockstiegel & Marietta Benko eds., 1995) [hereinafter “IGA”].
63. See IGA, *supra* note 62, art. 16. A limited set of exceptions to the cross-waiver were provided for, relating to such special cases as wilful misconduct and intellectual property, or concerning claims by natural persons for bodily injury, impairment of health or death; *cf.* IGA, *supra* note 62, art. 16(3.d). The cross-waiver was comprehensively construed also in that the “Protected Space Operations” and the categories of activities covered by it, were not confined to operations on board the ISS or relating to its launches or station-keeping, but also included all sorts of (terrestrial) tests, visits and exchanges; *cf.* IGA, *supra* note 62, art. 16(2.f).
64. Of course, the same would apply to any other ISS-partner state, but at that point in time apart from Russia itself, only the United States had a module in place on

face a situation where Tito could cause damage to the U.S. module or U.S. experiments without being able to hold Russia or the Russian Space Agency liable for such damage.

This possibility was foreshadowed by the IGA only to the extent that if partner states would bring in a separate state or a private entity under the jurisdiction of such a state, they would require consultation with and a presumptive consensus of other partner states in order to do so.<sup>65</sup> Moreover, states should seek “to avoid causing serious adverse effects on the use of the Space Station by the other Partners . . . .”<sup>66</sup> At the same time, the IGA also provided that respective partner states would maintain jurisdiction and control over their respective modules; in other words, it was essentially within the sovereign discretion of Russia to allow Tito on board its module.<sup>67</sup> More specifically, partner states have “the right to barter or sell any portion of their respective allocations . . . .”<sup>68</sup> The resulting deadlock was solved by a special *ad hoc* agreement between the relevant states, which provided for a prohibition of Tito leaving the Russian module, Russia taking out liability insurance, and NASA (and the other space agencies) dropping further resistance against his presence on board the ISS.<sup>69</sup>

Once NASA realized that bringing tourists to the space station, as long as properly covered by appropriate legal arrangements, could actually be a beneficial operation (partly because of the trend towards allowing partial commercialization of space station activities in order to help alleviate governmental budget problems), its attitude fundamentally changed.<sup>70</sup> As a consequence, the possibility of bringing non-professionals to the ISS was generalized by means of agreement among the IGA parties on Principles Regarding Processes and Criteria for Selection, Assignment, Training, and Certification of ISS (Expedition and Visiting) Crewmembers in January 2002, which effectively provided for a category of “spaceflight participants” as separate from “astronauts.” Spaceflight participants, defined as “individuals . . . sponsored by one or more partner(s),” explicitly including

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the ISS. Moreover, U.S. authorities were most worried about amateur astronauts, read tourists, as they had been faced recently with a tragic accident on a U.S. submarine with visitors on board, happening to surface precisely under a Japanese fishing vessel, killing more than a dozen fishermen. Cf. Smith & Hörl, *supra* note 6, at 45 n.7; Collins, *supra* note 29, at 191.

65. See IGA, *supra* note 62, art. 9(3.a); André Farand, *Commercialization of International Space Station Utilization: The European Partner's Viewpoint*, 28 AIR & SPACE LAW 83, 84 (2003).

66. IGA, *supra* note 62, art. 9(4).

67. See IGA, *supra* note 62, art. 5(2).

68. IGA, *supra* note 62, art. 9(2).

69. See Steven 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, 2-3 (2005); Sgrosso, *supra* note 58, at 59-60.

70. See Freeland, *supra* note 69, at 2-3.

tourists, were allowed to be on board the ISS as long as in conformity with the aforementioned principles.<sup>71</sup> It was under this regime that the subsequent space tourists would visit the ISS.

It should be noted, however, that this development did not in any sense change the liability situation as dealt with by Article 16 of the IGA—or for that matter the Liability Convention—as far as international third-party liability is concerned.<sup>72</sup> The cross-waiver continues to stand, making the state under whose jurisdiction a tourist is going up (so far, this concerns Russia only) immune from claims under the IGA for damage caused by such a tourist, whereas at the same time, that state continues to be liable for international third-party damage, something to be possibly—but not automatically or necessarily—deflected through the particular contract with the “tourist company” involved, obliging it to reimburse the state any relevant international claim.

## VI. LIABILITY ISSUES IN SUB-ORBITAL SPACE TOURISM

Essentially, the revolutionary aspect of the next step in private spaceflight, sub-orbital space tourism, which is about to take off following the conclusion of the X Prize competition in October 2004, is that this type of spaceflight not only concerns private tourists, but also private spacecraft.

### A. Applying Air Law or Space Law to Sub-Orbital Space Tourism?

Sub-orbital space tourism has often been compared to air transport for reasons of legal analysis and development. In particular, in aviation’s “barn storm” era in the early decades of the twentieth century, aviation was driven by daring private individuals on their own ac-

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71. 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 *THE INTERNATIONAL SPACE STATION—COMMERCIAL UTILISATION FROM A EUROPEAN LEGAL PERSPECTIVE* 47, 54–55 (Frans G. von der Dunk & M.M.T.A. Brus eds., 2006); Smith & Hörl, *supra* note 6, at 46 n.24, (making reference to Article III of the Principles Regarding Processes and Criteria for Selection, Assignment, Training and Certification of ISS (Expedition and Visiting) Crewmembers). See, e.g., A. Farand, *ISS Cooperation: Recent Developments in Rule Making*, *ESA BULLETIN* 111 (Eur. Space Agency, Paris, Fr.), Aug. 2002, at 82; Freeland, *supra* note 69, at 3–4; Farand, *supra* note 65, at 84–87.

72. See IGA, *supra* note 62, art. 17(1) (expressly confirming that “except as otherwise provided in Article 16, the Partner States, as well as ESA, shall remain liable in accordance with the Liability Convention”). See also A. Farand, *Jurisdiction and Liability Issues in Carrying out Commercial Activities in the International Space Station (ISS) Programme in THE INTERNATIONAL SPACE STATION—COMMERCIAL UTILISATION FROM A EUROPEAN LEGAL PERSPECTIVE* 87, 92–93 (Frans G. von der Dunk & M.M.T.A. Brus eds., 2006).

count and risk, trying to develop the most feasible methods for humans to stay up in the air. Such aviation pioneers were often motivated by prize money offered for certain specific achievements or records.

From a legal perspective, however, this comparison does not seem all that appropriate beyond such a comparison with the “barn storm” era. Rather than transporting any passengers from one place on the earth’s surface to another, the current plans as outlined earlier are essentially about a simple “up-and-down,” a kind of sophisticated (and rather expensive) form of bungee-jumping. To that extent, comparisons with today’s high-risk adventure tourism such as canyoning, extreme mountaineering, or survivalling, and the liabilities involved, are much more on point than comparisons with today’s air transport industry.

It may further be noted that, at least in the case of the X Prize and Virgin Galactic, being over 100 kilometers in altitude was sold by the company as “being in outer space.” Such a private sales-pitch, of course, cannot prejudice any international agreement on what constitutes outer space, but unfortunately for the time being, such international agreement is missing.<sup>73</sup>

So, the question remains whether sub-orbital flight occurs in “outer space” for purposes of international space law and the consequent exercise of national jurisdiction, including regulating liability. The Outer Space Treaty in this respect provides for “international responsibility for national activities in outer space,” requiring “authorisation and continuing supervision” of “the appropriate State” in case these activities are undertaken by private entities.<sup>74</sup> At the same time, no state is entitled to exercise jurisdiction in outer space on a territorial basis, since outer space is free from “national appropriation.”<sup>75</sup>

## B. National Law and Sub-orbital Space Tourism

In the case of the United States, among other nations, the aforementioned authorization and continuing supervision has indeed been taken care of, notably through the licensing regime established under the Commercial Space Launch Act as most recently amended in 2004.<sup>76</sup> This also takes care of the liability, notably through sections 70112 and 70113. These clauses, among other things, establish a

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73. See *infra* Part VII.B.

74. Outer Space Treaty, *supra* note 2, art. VI.

75. Outer Space Treaty, *supra* note 2, art. II.

76. See Commercial Space Launch Amendments Act of 2004, Pub. L. No. 108-492, 118 Stat. 3974 (2004) (codified as amended at 49 U.S.C.A. §§ 70101-70305 (West 2004)). The original Commercial Space Launch Act was enacted in 1984. Commercial Space Launch Act, Pub. L. 98-575, 98 Stat. 3055 (1984).

mechanism for imposing a cap on the reimbursement obligation resting upon the licensee, which is calculated using such concepts as "maximum probable loss," the maximum insurance available against reasonable rates, and a ceiling of reimbursement for third-party liability purposes of \$500,000,000 U.S.<sup>77</sup> It also obliges the licensee to then either insure against the maximum of possible reimbursement or show "financial responsibility" to the same amount.<sup>78</sup>

With a view to Spaceport Sweden, it is noteworthy that Sweden also has a national space law including a licensing system in place, albeit a rather succinct one. It does provide, however, for anyone "launching . . . objects into outer space and all measures to manoeuvre or in any other way affect objects launched into outer space" the obligation to obtain a license, including where such a launch takes place from Swedish soil.<sup>79</sup> Furthermore, the licensee will have to fully reimburse any claim against the Swedish government as a consequence of licensed activities entailing Sweden's international third-party liability, unless "special reasons tell against this."<sup>80</sup> Unlike the U.S. case, therefore, there is no principled cap on the reimbursement.

Still, as the carrier for the SS-2 spacecraft itself is an aircraft, the question also arises whether national air law, including its liability system might also apply. It may be noted in this regard that both White Knight, the carrier aircraft of the SS-1, and the SS-1 itself "were registered as experimental aircraft. The SS-1 was adorned with the FAA registration number N 328 K, where 328 K referred to the 328,000 feet that was the intended altitude for the Ansari X-prize."<sup>81</sup>

Virgin Galactic, however, aims at having the combination of carrier and SS-2 to be formally defined as a spacecraft under authority of the Office of the Administrator for Space Transportation with the U.S. Federal Aviation Administration ("FAA"). Yet, the carrier itself, an aircraft of Boeing 757-size, is a more or less normal aircraft. Even the

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77. See Commercial Space Launch Act, 49 U.S.C.A. § 70112(a.3). In short, the lowest of these three amounts will rule to establish the maximum to the reimbursement obligation in any particular license, albeit that the U.S. legislators choose to limit the extent to which the U.S. government would itself accept an obligation to compensate to \$1,500,000,000 U.S. over and above the first tier of damage to be reimbursed by the licensee. This nevertheless leaves open the question as to what would happen if the total international third-party liability claim would exceed even the combined total of reimbursement obligation for the licensee (first tier) plus U.S. governmental commitment (second tier).

78. Commercial Space Launch Act, 49 U.S.C.A. § 70112(a.4).

79. Act on Space Activities, § 1, 1982: 963, Nov. 18, 1982; National Space Legislation of the World, Vol. I (2001), at 398; Space Law—Basic Legal Documents (Karl-Heinz Bockstiegel & Marietta Benko eds., 1995), E.II.1; 36 Zeitschrift für Luft- und Weltraumrecht (1987), at 11; see also Sec. 2, Act on Space Activities.

80. Act on Space Activities, § 6.

81. Von der Dunk, *supra* note 7, at 3. See van Fenema, *supra* note 15, at 399–400, 407 pt. 3.3. See Freeland, *supra* note 69, at 2–3.

SS-2 vehicles, like the SS-1, will operate as a glider in their return phase and will be registered under N 400 K—400,000 feet being the intended altitude for SS-2. Finally, the company is aiming to have the combination certified under the regime applicable to the certification of aircraft in the United States; albeit it has no intention to go through all the testing normally required for that purpose.<sup>82</sup>

As a consequence, there might be some questions as to whether air law liability rules would apply in addition to the space law regime, as the space law regime is not triggered by the place where damage is caused (outer space or airspace) but by being caused by a “space object” “launched into”—or intended to be launched into—outer space.<sup>83</sup> In this sense, the carrier aircraft is also to be seen as the “launch vehicle” for the space object proper, at least until separation of SS-2 from it, thus entailing possible liability under the Liability Convention as well.<sup>84</sup>

### C. Applying the Liability Convention to Sub-orbital Space Tourism?

As for the application of the Liability Convention to this version of private spaceflight, it should be pointed out that the potential for the Convention to become applicable is rather limited, certainly for the time being, in view of its application to “international” liability issues. Given the rather straightforward up-and-down character of the operation, the chance of a carrier aircraft (or even the SS-2) causing damage outside of U.S. borders (in Mexico) from either California (for launches from the Mojave desert) or New Mexico (for the future launches from Spaceport America) is fairly small. Damage caused on U.S. territory itself could only entail liability under the Liability Convention in case of foreigners being hurt or damaged who were *not* “participating in the launch . . . .”<sup>85</sup>

That may soon change, however, in view of the intended Virgin Galactic operations per 2012 from Kiruna, as the distance from the intended Spaceport Sweden to the borders of Norway and Finland is

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82. See von der Dunk, *supra* note 7, at 3.

83. See Liability Convention, *supra* note 38, art. I(d). While “space object” has not been defined in any appreciable detail by the Convention, general opinion would have it that the element of “launch” is key in determining whether something qualifies as a space object for the purpose of the Liability Convention and the other space treaties. Cf. B. Cheng, *Studies in International Space Law* (1997), 324–26, 464, 493–95; Hobe & Cloppenburg, *supra* note 3, at 381.

84. Liability Convention, *supra* note 38, art. I(d) provides in full: “The term ‘space object’ includes component parts of a space object as well as its launch vehicle and parts thereof.” See also Cheng, *supra* note 83, at 464, 500–01.

85. Cf. Liability Convention, *supra* note 38, art. VII(d), as discussed *supra* Part IV. See also Freeland, *supra* note 69, at 11; van Fenema, *supra* n. 15, at 400.

considerably smaller.<sup>86</sup> Even more important are the plans of Space Adventures to build spaceports for similar purposes in the United Arab Emirates and Singapore, two of the smallest nations in the world in terms of surface areas.

Finally, as to the international implications of these developments, it should first be pointed out that the SS-2 flights, as launched from Spaceport America, will only briefly enter outer space at its edges, normally staying well out of any potentially conflicting trajectory of other space objects. Thus, the U.S. actions that are already being undertaken and that are currently anticipated have few international ramifications. This applies also to the solutions drafted regarding issues as whether and how to license and certify the craft, the operations, and the crew.

At a later stage, of course, such national U.S. legislative actions, both justified and made necessary by Virgin Galactic's impending activities, may have a considerable bearing on the development of other nation's actions. U.S. action may also affect international regulation of the matter, including decisions about national regulation in other countries, such as the United Arab Emirates and Singapore. Even Sweden, which currently has a national space law in place that is rather different in its handling of liability issues, intends to essentially follow the U.S. approach on these issues.<sup>87</sup> The United States' influence over these issues is evidenced in that the U.S. authorities have, consciously or unconsciously, interpreted the relevant concepts that are not well defined at the international level, such as that of "space object," "launch" (as it would help to define "space object"), "persons participating in the launch," and even "outer space."<sup>88</sup>

From this angle, while it is both justified and necessary for the U.S. to deal with liability on the national level (as to both third-party and contractual liability), as well as the issue of whether waivers or reimbursements *vis-à-vis* the U.S. government indeed would be an internal matter, international ramifications may arise within a few years. These international issues also concern the question of "license shopping"—whether other states might be inclined to offer licenses on easier, less burdensome conditions, in particular on issues of liability. This may, after all, bring in questions of air law, since in that area at

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86. The distance from Spaceport America to the U.S. border with Mexico is some 120 kilometers, whereas Norwegian territory comes as close to Kiruna as some 80 kilometers. More importantly, in view of the rotation of the earth, is the fact that Mexico lies due south of Spaceport America, whereas Norway lies to the west through north and Finland to the north through east of Spaceport Sweden, making the latter's geographical position considerably more likely to lead to impacts on foreign territory than is the case with the former.

87. See de Selding & Malik, *supra* note 24, at 10.

88. See Liability Convention, *supra* note 38, arts. I(d), VII(b). As for the discussion of the definition of "outer space," see *infra* Part VII.B.

least major efforts have been made to harmonize international liability and compensation issues, whereas in terms of high-risk adventure tourism, there is no international harmonization whatsoever in terms of liability.<sup>89</sup>

## VII. LIABILITY ISSUES IN SUB-ORBITAL PRIVATE SPACEFLIGHT

With the plans for sub-orbital private spaceflight as briefly discussed before, another dimension is added as compared to that of private sub-orbital tourism; the former concerns private spaceflight involving private operators, private spacecraft, and private tourists, and this time with a fundamentally international character and scope. Actually, two types of operations may be subsumed under this third type of spaceflight, distinguishing themselves fundamentally from the previously discussed type in that the place of departure and the place of arrival are no longer identical. At the same time, it should be noted that the analysis here will be of a more provisional and general character in view of the time it will likely take for sub-orbital private spaceflight to become operational and the consequent lack of current availability of any further technical, operational, and commercial details of such operations.

### A. Earth-to-Earth, Earth-to-Space, and Space-to-Earth Transportation and Liability

The first type of operation concerns earth-to-earth transportation—both of passengers and of cargo, although the costs per trip likely will not make it worthwhile for some time to transport cargo in that manner. This is most fundamentally where private spaceflight becomes most like air transport and partly interferes with it, both in an operational sense (the first and last stretches of the flight will be in an airspace where aircraft are bound to fly) and in an economic sense (this type of private spaceflight would compete with normal air transportation, off-setting greater cost with greater speed of transport).

The distinction with sub-orbital space tourism is not absolute, as there is certainly a tourism element involved here as well. On the one hand, just like the air transport industry offers to those primarily interested in the experience of flying cheap trips on available seats where the destination does not matter, such tourists may—if sufficiently well-to-do—also take a private sub-orbital flight for the sheer thrill of it. More substantially, on the other hand, tourists will take these flights just as they may use air transport to get to the ultimate tourist destination, which, in the case of Virgin Galactic's future oper-

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89. For a brief discussion of air law liability, see *infra* Part VII.D.



ations, may include the additional thrills offered by Spaceport Sweden, such as a launch into the *Aurora Borealis* or a stay in an ice-hotel.<sup>90</sup>

The second type of operation concerns earth-to-space and space-to-earth transportation. Again, this may possibly concern tourists—for example, going to the future space hotels which form the fourth type of private spaceflight considered in this article—but may equally possibly concern professional astronauts going to or coming back from the ISS. This, however, would require proof that the technology is proven to be both safer and cheaper than existing manned spaceflight. Both events are fundamentally space transportation—an activity taking place in outer space for the greater part and of a typically space-oriented character.

In respect of both aviation-like and astronaut types of travel, the Liability Convention applies in theory and will also, in view of the damage easily being “international,” be relevant in any real-life case of damage. Thus, the question of harmonization of licensing systems and how the systems deal with liabilities *vis-à-vis* privately licensed operators in order to avoid cheap “flags of convenience” in outer space is back with redoubled force here. Also in other respects, the application of international space law through national law would no longer be only a national matter, including the definitional issues referred to earlier.

## **B. The Boundary Question Revisited: Air Space versus Outer Space**

The last point relates in particular to the boundary question as between airspace and outer space, in view of the need to apply national regimes, whether harmonized or not, and whether based on air law or on space law.<sup>91</sup>

The problem is that there is no international agreement on where outer space begins and airspaces end or even a consensus on the *need* for a border. The discussion is as old as man’s entry into space in 1957, when the orbits of *Sputnik I* posed the vexing question of how high traditional sovereignty of states over the airspace above their territories<sup>92</sup> actually extended. When it was formally and internationally agreed that outer space is a global commons, as per Article II of the Outer Space Treaty outside the sovereignty of any individual state

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90. Cf. de Selding & Malik, *supra* note 24, at 10.

91. See, e.g., Cheng, *supra* note 83, at 497–98; van Fenema, *supra* note 15, at 397–98.

92. See Convention on International Civil Aviation, art. 1, Apr. 4, 1944, 15 U.N.T.S. 296[hereinafter “Chicago Convention”].

as a *terra communis*,<sup>93</sup> this only reinforced the need to establish a clear boundary between the two areas subject to regimes with such fundamental differences.

Then, however, the Committee on the Peaceful Uses of Outer Space ("COPUOS") found it could not establish any consensus on the boundary question.<sup>94</sup> Some states and experts proposed drawing the boundary, at least for legal purposes, at varying altitudes, with some others making a case for a multiple-zone regime. Other states, including some of the major space-faring nations (most notably the United States) considered establishing a boundary premature, in view of possible later technological developments. Finally, some states adhered in straightforward fashion to a "functionalist" theory, whereby the drawing of any borderline was considered to be largely irrelevant and counterproductive, as air law should simply apply to aircraft (vehicles essentially involved in transporting passengers and cargo from one place on earth to another) and space law should apply to space objects (including those vehicles essentially conducting space exploration or other space activities).

While the question remained a theoretical one for a long time, from time to time it raised its head. For instance, in 1976 some equatorial countries tried to claim parts of the geo-stationary orbit, as the orbit over the equator at an altitude of some 35,800 kilometers was of special interest for telecommunications. These equatorial countries claimed that such spaces which were "above" their respective territories were subject to their respective sovereignty.<sup>95</sup> The appearance of the space shuttle in 1981, functioning partly as a space object, partly as an aircraft, again raised the issue of the space border, although the decision of the U.S. authorities to register the shuttle as a space object with the U.N. Secretary-General under the Registration Conven-

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93. See Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, G.A. Res. 1962 XVII, ¶¶ 2-3, U.N. Doc. A/AC.105/575/Rev.1 (Dec. 13, 1963); Outer Space Treaty, *supra* note 2, art. I.

94. For a more extended account of the "legal history" of the discussions concerned, see, e.g., Frans G. von der Dunk, *The sky is the limit - but where does it end? New Developments On the Issue of Delimitation of Outer Space*, 2005 PROCEEDINGS OF THE FORTY-EIGHTH COLLOQUIUM ON THE LAW OF OUTER SPACE 84, 85-90.

95. This was the famous Bogota Declaration of Dec. 3, 1976, EL ESPECTADOR, Dec. 7, 1976, at 13A translated in 6 SPACE L. 193, at 194 para. 2 (1978). The result was, *inter alia*, a claim by the equatorial countries that any "[d]evices to be placed in a fixed position on an equatorial [s]tate's segment of the geostationary orbit shall require previous and expressed authorization on the part of the [s]tate concerned . . .," as if such a device equated with an aircraft traversing sovereign national airspace. *Id.* at 195, ¶ 3(d); see, e.g., Freeland, *supra* note 3, at 187 n.17.

tion<sup>96</sup>—rather than as an aircraft under the Chicago Convention—settled the matter in that case.<sup>97</sup>

However, in spite of several concrete proposals to establish a boundary, it has never been achieved at an international level.<sup>98</sup> Hence, interpretations at the national level, made by the United States as well as by other states confronted with the need to delineate the scope of their sovereign jurisdiction upward, become important. In this respect, a number of relevant developments may be noted.

First, in 1995, the Legal Subcommittee of COPUOS addressed a questionnaire to its member states on the issue of “aerospace planes,” a conceptual vehicle, in a sense a follow-up to the space shuttle, that would enjoy double functionality (in terms of aviation, respectively space activities) and hybrid operating capacity (that is both as an aircraft and as a spacecraft).<sup>99</sup> This questionnaire resulted in some interesting answers. Pakistan referred to “altitudes lower than between 90 and 100 km” as essentially constituting air space,<sup>100</sup> Russia claimed an “international practice . . . [was] evolving, [whereby] State . . . sovereignty [did] not extend to the space located above the orbit of least perigee of an artificial Earth satellite (approximately 100 km above sea level),”<sup>101</sup> and Germany equated entry below a 100 kilometer altitude to “re-entry into the Earth’s atmosphere.”<sup>102</sup>

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96. See generally Convention on Registration of Objects Launched into Outer Space, arts. II, III, IV, Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter “Registration Convention”].

97. Cf. Chicago Convention, *supra* note 92, art. 17.

98. E.g. van Fenema, *supra* note 15, at 397–98.

99. COPUS, *Questionnaire on Possible Legal Issues with Regard to Aerospace Objects*, U.N. Doc. A/AC.105/C.2/1995/CRP.3, based on a Russian Federation working paper *Questions Concerning the Legal Regime for Aerospace Objects*, U.N. Doc. A/AC.105/C.2/L.189 (Mar. 30, 1992) presented to the Committee on the Peaceful Uses of Outer Space, Report of the Legal Subcommittee on the Work of its Thirty-First Session, U.N. Doc A/AC.105/514 (Apr. 20, 1992).

100. COPUS, *Questionnaire on Possible Legal Issues with Regard to Aerospace Objects: Replies From Member States*, p. 6, delivered to the General Assembly, U.N. Doc. A/AC.105/635 (Jan. 15, 1996); The Secretariat, Note entitled *Comprehensive Analysis of the Replies to the Questionnaire on Possible Legal Issues with Regard to Aerospace Objects*, U.N. Doc. A/AC/105/C.2/L.204 delivered at the Thirty-Sixth Session of the Legal Subcommittee, U.N. Doc A/AC.105/674 (Apr. 14, 1997).

101. The Secretariat, Note entitled *Comprehensive Analysis of the Questionnaire on Possible Legal Issues with Regard to Aerospace Objects*, U.N. Doc. A/AC.105/C.2/L.204 delivered at the Thirty-Sixth Session of the Legal Subcommittee, U.N. Doc. A/AC.105/674 (Apr. 14, 1997); Committee on the Peaceful Uses of Outer Space, *Questionnaire on Possible Legal Issues with Regard to Aerospace Objects: Replies From Member States*, p. 6, delivered to the General Assembly, U.N. Doc. A/AC.105/635/Add.1 (Mar. 15, 1996). It may also be noted that the Russian Federation had earlier tabled several proposals for determining an altitude at which outer space was supposed to begin, usually referring to altitudes of 100–110 kilometers.

102. A/AC.105/635, *supra* note 100, at 4–5.

More forcefully, the South African national space act provided for a definition of “outer space” as “the space above the surface of the earth from a height at which it is in practice possible to operate an object in an orbit around the earth,” which under current practice and possibilities refers to an area above 100 kilometers in altitude.<sup>103</sup> Even more forcefully—and recently—Australia 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.”<sup>104</sup> Apparently, also the Isle of Man’s Treasury Regulations have used the same “demarcation point” to define “space object.”<sup>105</sup>

Then, it is interesting to note that, while the United States itself has indicated wishes to refrain from determining any borderline between air space and outer space (at least for the time being), the FAA has accorded astronaut’s wings to anyone flying above 62.5 miles altitude, an awkward figure in itself, translating however into 100 kilometers.<sup>106</sup> This last figure is also the boundary between air space and outer space as far as the *Fédération Aéronautique Internationale* (“FAI”), the global world aviation sporting events organization, is concerned.<sup>107</sup> And at least one U.S. state, Virginia, contemplated legislation using the same altitude to define outer space.<sup>108</sup> An even more relevant state, New Mexico, maintains an upper limit of the area under which it will exercise its jurisdiction in tax matters of 60,000 feet, which translates into only approximately eighteen kilometers.<sup>109</sup>

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103. Sec. 1, ¶ 15 indent, Space Affairs Act, Sept. 6, 1993, assented to on June 23, 1993, No. 84 of 1993; Statutes of the Republic of South Africa – Trade and Industry, Issue No. 27, 21-44; National Space Legislation of the World, Vol. I (2001), at 413.
  104. Sec. 8, An act about space activities, and for related purposes, No. 123 of 1998, assented to Dec. 21, 1998; National Space Legislation of the World, Vol. I (2001), at 197; as amended by Act No. 100 of 2002. *See, e.g.*, van Fenema, *supra* note 15, at 398; Freeland, *supra* note 3, at 187 n.18.
  105. Freeland, *supra* note 3, at 187 n.18.
  106. *See* Launius & Jenkins, *supra* note 4, at 279 n. 63. By contrast, the U.S. Navy and NASA have routinely handed astronaut wings to those having achieved altitudes of 50 miles and over, as confirmed by private e-mails from R. M. Bresnik, Attorney-Adviser at NASA’s Legal Office (Mar. 19 & 22, 2007) (on file with author).
  107. *See* Launius & Jenkins, *supra* note 4, at 279 n.63.
  108. Space Flight Liability and Immunity Act, H.D. 3184, 2007 Sess., Art. 24 § 8.01-227.8 (Va. 2007) defines “spaceflight activities” by means of a one-on-one reference to suborbital flights and then defines “suborbital” to mean “a distance at or above 62.5 miles from the Earth’s mean sea level.” This bill was subsequently amended and not enacted with the above definition, but instead refers to a definition provided by the United States Code.
  109. New Mexico defined space as “any location beyond altitudes of sixty thousand feet above the earth’s mean sea level” in the Gross Receipts and Compensating Tax Act, N.M. STAT. ANN. § 7-9-54.2 (LexisNexis 2005); following an e-mail from L. Montgomery, Senior Attorney, Office of the Chief Counsel of the FAA (Mar. 6, 2007) (on file with author).

Finally, some evidence that a trend may be converging on a borderline at 100 kilometers was referred to by a recent Study of the International Academy of Astronautics ("IAA"), which makes reference to 100 kilometer altitude as the point of re-entry into a national airspace.<sup>110</sup>

In sum, a slow and haphazard consensus may be gradually arising that until specific developments would make such a consensus untenable once more, an altitude at 100 kilometers would be an appropriate altitude at which to separate the legally distinct areas of airspace and outer space, at least for those sets of rules that did not specifically focus on aircraft as opposed to spacecraft—or air transport functions as opposed to outer space-focused activities.

Such a vertical limitation to the extent in which individual states would be entitled to exercise their sovereign jurisdiction, for example for the purpose of applying national regimes on liability, was not of major importance in the case of "sub-orbital tourism," as this only briefly and marginally involves outer space, with the vehicle ever so quickly returning into the same airspace from which it jumped out.

Obviously, with "sub-orbital spaceflight," this is totally different—the craft will be flying in outer space for an extended part of the trajectory and, almost by definition, will be returning into the atmosphere in a different state's national airspace (if performing earth-to-earth transportation) or even find its destination in outer space (if performing earth-to-space transportation).

### C. Traffic Management in Outer Space with a View to Liability

Thus, the uncertainty about the proper borderline between areas subject to an individual state's sovereignty (airspaces) and an area where such sovereignty fundamentally does not apply (outer space) has also fueled uncertainty as to how to handle future "space traffic" in terms of management and, in particular, the safety-focused aspect of *traffic control*. While many authors logically look to the ICAO for arranging for a workable system for the management of traffic in outer space, in view of both its inherent similarities to air traffic management and its factual interference with air traffic (spacecraft can only reach outer space through airspace and need to return to earth through airspace),<sup>111</sup> the "how" thereof requires close evaluation and analysis of the existing situation with a view to dealing with liabilities for damage caused partly or wholly by erroneous or absent traffic information.

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110. See COSMIC STUDY ON SPACE TRAFFIC MANAGEMENT, INTERNATIONAL ACADEMY OF ASTRONAUTICS, 39 (Corrine Contant-Jorgenson et al. eds., 2006).

111. See COSMIC STUDY ON SPACE TRAFFIC MANAGEMENT, *supra* note 110, for an extended analysis of the consequences thereof for the need to establish a proper traffic management regime.

First, the ICAO has not yet been given the authority of guiding or arranging the process of establishing a proper traffic management system in the area of outer space. The closest analogy here is the established authority of the ICAO to deal at the highest level with traffic management issues in the airspaces over the high seas under the Chicago Convention. However, this still requires explicit "appointment" of one state actually being authorized to, as well as made correspondingly responsible for, the safety of aviation in a particular Flight Information Region ("FIR") over the high seas, with the general consent of the other ICAO member states.<sup>112</sup>

If the ICAO is to fulfill the same task in outer space, it would seem that a similar clause in the Chicago Convention would be necessary with respect to that area, which will likely raise—much more than with the airspace over the high seas—issues of political sensitivity (in view, for example, of the many military uses of outer space) as well as of how to carve up outer space into feasible FIR's. Whereas FIR's over the high seas essentially can still be viewed as being of two-dimensional character, the altitude at which an FIR would find its vertical limit so far never having been an issue, and moreover being by definition not "above" any state's sovereign territory; in outer space, all this is fundamentally different.

Second, following the ICAO model would still mean that the appropriate organization of an individual state would be mandated to provide traffic management services. Only in some limited instances in Europe, an international organization ("Eurocontrol") has been mandated to actually provide air traffic services itself.<sup>113</sup> A state providing air traffic services would also be internationally responsible for it<sup>114</sup>—but not automatically liable—since in many cases sovereign immunities of air traffic service providers, which are still governmental entities, have precluded any fundamental agreement on liability of air traffic service providers.<sup>115</sup>

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112. See van Fenema, *supra* note 15, at 401. This system was developed on the basis of the Chicago Convention, *supra* note 92, arts. 12, 37(c), 44(a), (f), (h), Chicago Convention.

113. Eurocontrol was established in its original version by means of the Convention Relating to Co-operation for the Safety of Air Navigation, Dec. 30, 1960, 523 U.N.T.S. 117 [hereinafter "Eurocontrol Convention"]. It is currently being fundamentally revised. Cf. Protocol Consolidating the Eurocontrol International Convention Relating to Co-operation for the Safety of Air Navigation, June 27, 1997, Cm 5587, not yet entered into force; Eurocontrol Revised Convention, Sept. 1997 ed. at Eurocontrol.

114. By analogy to Chicago Convention, *supra* note 92, art. 28, the responsibility of a state providing air traffic services in an FIR would apply also in the special case of the provision of such services over the high seas.

115. See Francis P. Schubert, *An International Convention on GNSS Liability: When Does Desirable Become Necessary?*, 24 ANNALS OF AIR AND SPACE LAW 245, 258–59, 262–63 (1999).

As discussions in the context of the use of Global Navigation Satellite Systems (“GNSS”) for air traffic services have shown, states are generally reluctant to accept a foreign state providing such services when such a state did not accept liability on the international level.<sup>116</sup> For example, in the case of the U.S. global positioning system (“GPS”), the possibility to claim compensation from relevant U.S. authorities for damage caused by flaws or the absence of GPS signals at critical moments is limited to claims before U.S. courts in a private capacity, as allowed by a few U.S. statutes essentially lifting sovereign immunity for that purpose.<sup>117</sup>

#### D. The Key Elements of Air Law Liability Regime

The analysis so far has already made considerable reference to the situation in aviation, and, as indicated before, this will be even more the case when turning to the liability issues. Starting from the vantage point of third-party liability, air law shows a rather fragmented international picture when compared with the Liability Convention, as the latter includes almost all states, important from the perspective of launch capabilities, as these are key to allocating liability.

An international convention does exist relating to on third-party liability for damage caused by aircraft, essentially on the ground, which is the Rome Convention of 1952.<sup>118</sup> In spite of a later update raising the limits of compensation for relevant cases of damage by means of the Montreal Protocol of 1978,<sup>119</sup> the Rome Convention both in its original and in its amended versions has received relatively few ratifications and was not signed by most of the important aviation states. This was primarily the result of disagreement on the limits of compensation, which were considered woefully inadequate by many of those states.<sup>120</sup> The result was, that in many cases of aviation acci-

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116. See, e.g., Schubert, *supra* note 115, at 248–58, 264–67; Frans G. von der Dunk, *Liability for Global Navigation Satellite Services: A Comparative Analysis of GPS and Galileo*, 30 JOURNAL OF SPACE LAW 129, 131, 140–43 (2004).

117. This concerns such acts as the Federal Tort Claims Act, 28 U.S.C. §§ 2671–2680 (2000 & Supp. IV 2004), the Suits in Admiralty Act, 46 App. U.S.C. §§ 741–752 (2000), the Foreign Claims Act, 10 U.S.C. § 2734 (2000 & Supp. IV 2004), and the Military Claims Act, 10 U.S.C. § 2733 (2000 & Supp. IV 2004); see Jonathan M. Epstein, *Global Positioning System (GPS): Defining the Legal Issues of its Expanding Civil Use*, 61 J. AIR L. & COMMERCE 243, 262–68 (1995).

118. *Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface*, Oct. 7, 1952, 310 U.N.T.S. 181, ICAO Doc. 7364 [hereinafter “Rome Convention”].

119. *Protocol to Amend the Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface*, Oct. 7, 1952, ICAO Doc. 9257 [hereinafter “Montreal Protocol”].

120. See, e.g., I.H.PH. DIEDERIKS-VERSCHOOR, *AN INTRODUCTION TO AIR LAW*, 148–50, (7th ed. 2001) (referring to a number of 45 ratifications for the Rome Convention by January 2001); James Brittom, *Roads from Montreal do not Lead to Rome*:

dents causing damage on the ground, national tort law applies without further ado, resulting in a large variety of principles, rules, and, in particular, limits of compensation being applicable.<sup>121</sup>

As for contractual ("inter-party") liability, regarding passengers and the consignors of cargo, early efforts to harmonize national regimes resulted in an international convention, the Warsaw Convention of 1929.<sup>122</sup> This convention, known for its limit to compensation per passenger of some \$10,000 U.S. has been repeatedly amended and updated, by such documents as the Hague Protocol,<sup>123</sup> which, among other things, raised the limit of compensation to some \$20,000 U.S.; the Guadalajara Convention,<sup>124</sup> essentially applying the Warsaw regime to non-scheduled, charter carriers; the Guatemala City Protocol,<sup>125</sup> which raised the limits to 100,000 Special Drawing Rights (SDR 100,000); and a set of Montreal Protocols.<sup>126</sup>

Most recently, the 1999 Montreal Convention<sup>127</sup> presented an effort to completely overhaul the Warsaw system, which had resulted in a complicated maze of applicable regimes in any concrete situation in

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*Criticism and Alternatives to the Draft Convention on Third Party Liability*, 30

- AIR & SPACE LAW 269, 269 n.1 (2005) (mentioning a decrease to 44 states parties).
121. See Carel J.J.M. Stolker & David I. Levine, *Compensation for Damage to Parties on the Ground as a Result of Aviation Accidents*, 22 AIR & SPACE LAW 2, 60-69 (1997).
  122. Convention for the Unification of Certain Rules Relating to International Transportation by Air, Oct. 12, 1929, 137 L.N.T.S. 11 [hereinafter "Warsaw Convention"]. For an extended overview of the Warsaw system as it developed from the Warsaw Convention, see Thomas J. Whalen, *The New Warsaw Convention: The Montreal Convention*, 25 AIR & SPACE LAW 12, 12-26 (2000).
  123. Protocol to Amend the Convention for the Unification of Certain Rules Relating to International Transportation by Air, Sept. 28, 1955, 478 U.N.T.S. 371 [hereinafter "Hague Protocol"].
  124. Convention Supplementary to the Warsaw Convention for the Unification of Certain Rules Relating to International Carriage by Air Performed by a Person other than the Contracting Carrier, Sept. 18, 1961, 500 U.N.T.S. 31 [hereinafter "Guadalajara Convention"].
  125. Protocol to Amend the Convention for the Unification of Certain Rules RELATING TO INTERNATIONAL CARRIAGE BY AIR, MAR. 8, 1971, ICAO Doc. 8932 [hereinafter "GUATEMALA CITY PROTOCOL"].
  126. Additional Protocol No. 1 TO AMEND THE CONVENTION FOR THE UNIFICATION OF CERTAIN RULES RELATING TO INTERNATIONAL CARRIAGE BY AIR, SEPT. 25, 1975, U.K.T.S. 1997 No. 75 (CMND. 6480), ICAO Doc. 9145; Additional Protocol No. 2 TO AMEND THE CONVENTION FOR THE UNIFICATION OF CERTAIN RULES RELATING TO INTERNATIONAL CARRIAGE BY AIR, SEPT. 25, 1975, U.K.T.S. 1997 No. 76 (Cmnd. 6481), ICAO Doc. 9146; Additional Protocol No. 3 TO AMEND THE CONVENTION FOR THE UNIFICATION OF CERTAIN RULES RELATING TO INTERNATIONAL CARRIAGE BY AIR, SEPT. 25, 1975, ICAO Doc. 9147; AND MONTREAL PROTOCOL No. 4 TO AMEND THE CONVENTION FOR THE UNIFICATION OF CERTAIN RULES RELATING TO INTERNATIONAL CARRIAGE BY AIR, SEPT. 25, 1975, U.K.T.S. 1999 No. 28 (CMND. 6483), ICAO Doc. 9148 [hereinafter "MONTREAL PROTOCOL 4"].
  127. Convention for the Unification of Certain Rules for International Carriage by Air, May 28, 1999, ICAO Doc. 9470 [hereinafter "Montreal Convention"].



view of the different versions of the regime which individual states had become party to, most prominently by doing away with the limitations to liability compensation in most instances and by inserting a fifth jurisdiction in which to claim liability.

While the ratification of the Montreal Convention proceeds at a promising pace and does include most of the major aviation states, only a near-comprehensive ratification would restore a kind of global harmonization of applicable rules for which the Convention aims.<sup>128</sup> Moreover, even the Montreal Convention leaves considerable leeway to national jurisdictions, which might still result in considerable differences from state to state as to the implementation and interpretation of the Convention's regime.

### **E. Applying the Air Liability Regime to Sub-orbital Private Spaceflight**

As both the third-party and the contractual liability conventions outlined above fundamentally address aviation, the key questions are (1) whether they *do*, or possibly *would*, apply; and (2) whether they *should* apply. The answer to these questions hinges upon two definitional issues.

First, the conventions are all applicable in some manner to the flight of *aircraft*—whether crashing on earth so as to damage third-party victims, or suffering any sort of accident damaging passengers or cargo on board. None of the conventions referred to above define aircraft, but all would essentially be bound by the general definition of aircraft as it has been developed in the context of the Chicago Convention, which also is very much focused on aircraft in terms of applicability of its regime and that of the Standards and Recommended Practices (“SARP’s”)<sup>129</sup> developed under it.

This generally accepted ICAO definition in its 1967-version provides: “Aircraft is 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.”<sup>130</sup> In particular the references to “atmosphere” and “air” indicate that at some altitude, in the absence of such physical matter, aircraft by definition cannot fly, which is where in

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128. Cf. Hobe & Cloppenburg, *supra* note 3, at 378.

129. Under the Chicago Convention, *supra* note 92, arts. 37 & 38, the Annexes containing SARP’s providing relevant technical, operational, and other details on specific issues addressed by the Chicago Convention constitute an integral part of the regime developed under that Convention, with the Standards included being by definition binding.

130. Revised and amended text of Annex 7 to the Chicago Convention, Nov. 6, 1967, ICAO Doc. No. 9294, Vol. 11. See DIEDERIKS-VERSCHOOR, *supra* note 120, at 5; L.B. GOLDBIRSCHE, THE WARSAW CONVENTION ANNOTATED: A LEGAL HANDBOOK 11 (2000) (on the specific application in the context of the Warsaw Convention); Hobe & Cloppenburg, *supra* note 3; van Fenema, *supra* note 15, 400–01.

practical terms rocket-mode propulsion *has* to take over. On the other hand, a craft which has hybrid propulsion allowing it to fly both in the air and in outer space could still be considered aircraft, since it still constitutes a "machine" which "*can* derive support from the air," even if it does not do so for all or even the major parts of its flight.

From a theoretical perspective, certainly some of the contemplated private spaceflight vehicles and parts thereof (such as the White Knight in case of SS-1) would qualify, but some others certainly would not. Moreover, on the national level (at least under the U.S. approach to sub-orbital space tourism so far) the activities and vehicles concerned were considered to be rather *sui generis*, causing a special regime to be provided for the time being which completely ignores both the third-party and the contractual liability systems of aviation currently applicable. This may change, that special regime being expressly determined to be of interim character. Moreover, obviously the definition of aircraft referred to is not unequivocally applicable to *all* sub-orbital private spaceflight, and at least a clarification exercise, preferably at the international level in view of the growing implication of other states than only the United States in the field, would seem necessary in order to dispel any doubts on this issue. This then raises the question of desirability of applying such a regime.

Here, it is submitted that in general it would be logical and appropriate to indeed start working on making the above liability system for aviation applicable without doubt to sub-orbital private spaceflight at least for contractual liability, once such flights are being offered by providers on a more or less routine basis, with the exception of passengers going to or coming back from a place of destination in outer space, notably to space hotels such as to be dealt with later.<sup>131</sup>

For third-party liability, further discussion might be necessary, for example, based on the extent to which aircraft-modes and rocket-modes of propulsion would be used in alternation, on which regime should be applied here. From the present perspective, the Liability Convention has a clear advantage over the air law-regime, since the latter, as indicated, exhibits a rather unsatisfactory lack of international coherence. Further, the limits included in the Rome Convention and Montreal Protocol in themselves would not be considered appropriate. On the other hand, the Rome Convention/Montreal Protocol/national tort law system has the benefit of leading to binding court decisions.<sup>132</sup> Conceivably, the two systems could be left in existence side-by-side, allowing cases where the vehicle in question can be defined as a space object in conformity with the Liability Convention to be dealt with under that Convention, if the states entitled to claim

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131. See *infra* Part VIII.

132. See Liability Convention, *supra* note 38, art. XIX(2).

under that Convention would so be inclined, as this does not take away the potential of individual claimants to assert claims in a private capacity in a national court of a potentially involved state.<sup>133</sup>

The second definition that becomes important is the scope of activities once the applicability of the conventions on the basis of the characterization of the vehicle as an aircraft is achieved. As the conventions focus on harmonization of national laws on the issue, they basically deal with *international* aspects of aviation, leaving it to national sovereign discretion whether to apply the relevant regime also to *national* air transport.

In this respect, the Chicago Convention already defines an "international air service" as "an air service which passes through the air space over the territory of more than one State."<sup>134</sup> As a consequence, for the general purposes of the Chicago Convention, its Annexes, and any further air law or regulation following from it, any private craft performing sub-orbital space tourism (the third category of private spaceflight considered here) would easily be subsumed under this definition once it can be defined as an "aircraft" following the above definition—"air service" is defined as "any scheduled air service performed by aircraft for the public transport of passengers, mail or cargo."<sup>135</sup>

As for third-party liability, however, the Rome Convention applies to "damage . . . caused in the territory of a Contracting State by an aircraft registered in the territory of another Contracting State." In other words, it is the (foreign) registration which determines its application, rather than its involvement in any international flight. Thus, once a vehicle would come to be defined as an "aircraft," its registration as such would immediately allow the Rome Convention to become applicable (of course once properly ratified by the state concerned). The Montreal Protocol interestingly broadens the scope to include aircraft "whatever its registration may be, the operator of which has his

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133. Liability Convention, *supra* note 38, art. XI(2), refers only to the courts of launching state(s) as venues for claims allowable regardless of an international claim being pursued under the Liability Convention. In case the defendant under Rome Convention/Montreal Protocol/national tort law is an operator from a state which does not qualify as a launching state, the Liability Convention would not seem to exclude the claimant going to another state to instigate private proceedings against the defendant, as the clause under consideration only determines the state(s) *where* claims can be asserted, not *against whom* they could be asserted. Of course, this might not be a very attractive option since the launching state's court may decline jurisdiction over a claim against a defendant from another state, especially if the claimant is not from that same launching state. Furthermore, it obviously requires definition of the vehicle to be a "space object" in order to trigger any potential applicability of the Liability Convention, which in turn, as discussed *supra* text accompanying note 88, also depends on its being "launched" in a normal sense of the word.

134. Chicago Convention, *supra* note 92, art. 96(b).

135. Chicago Convention, *supra* note 92, art. 96(a).

principal place of business or . . . his permanent residence in another [c]ontracting [s]tate." But, once more, any private craft used for spaceflight qualifying as an aircraft would be easily subsumed regardless of the international character of the flight.<sup>136</sup>

Finally, as to contractual liability, the Warsaw Convention applies to "international carriage," defined as "any carriage in which . . . the place of departure and the place of destination . . . are situated either within the territories of two High Contracting Parties, or within the territory of a single High Contracting Party, if there is an agreed stopping place within [the] territory" of another state, even if that state is not a High Contracting Party.<sup>137</sup> This would indeed apply to sub-orbital private spaceflight, as long as it is of the earth-to-earth character; if the transportation is earth-to-space or space-to-earth, as the destination in space by definition would not be "within the territory of a state," it would not fall within the scope of the Warsaw Convention at least as of yet.<sup>138</sup>

The Hague Convention offered essentially the same definition for "carriage."<sup>139</sup> Neither the Guatemala City Protocol, nor Montreal Protocol No. 4 (which is the relevant one here), nor the Guadalajara Convention, amended the latter version.<sup>140</sup> The Montreal Convention of 1999, finally, in relevant parts exactly copies the same provisions of Article I of the Warsaw Convention as amended by the Hague Protocol.<sup>141</sup>

Consequently, for earth-to-earth private suborbital spaceflight, the international third-party liability regime of the Rome Convention/Montreal Protocol could easily be made applicable—a conclusion applicable to earth-to-space and space-to-earth transportation in a similar fashion. The contractual liability regime, from Warsaw Convention to Montreal Convention, would itself be applicable already now to the extent the craft involved would be, or could be, defined as "aircraft" in the sense of the ICAO definition provided before. It is therefore essentially the uncertainty remaining as a consequence of various types of vehicles and constructs envisaged, the potential "dual

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136. Montreal Protocol, *supra* note 119, art. XII.

137. Warsaw Convention, *supra* note 122, art. 1(1) & (2). For an extended analysis of this phrase, see GOLDHIRSCH, *supra* note 130, at 14–19.

138. Hobe & Cloppenburg, *supra*, n. 3, at 379, argue that a "place of destination," qualifying relevant flights for falling within the scope of the contractual liability regime, "is not necessarily a place on the ground," but their analysis rightly limits itself to "places of destination" in an airspace for the purpose of air-launching a vehicle (such as the SS-1) and such airspace is legally to be seen as part of the territory of a state; *cf.* Chicago Convention, *supra* note 92, art. 1.

139. *See* Hague Protocol, *supra* note 123, art. I.

140. *Cf.* Guatemala City Protocol, *supra* note 125, art. I; Montreal Protocol 4, *supra* note 126, art. I; Guadalajara Convention, *supra* note 124, art. II.

141. *See* Montreal Convention, *supra* note 127, art. 1(1) & (2).

use” of one flight for earth-to-earth, earth-to-space and space-to-earth transportation at the same time, and the applicability of space law, including its liability regime—which will not go away merely because of any applicability of the air law liability regime—which warrants further discussion on the proper way to go forward in this respect.<sup>142</sup>

### VIII. LIABILITY ISSUES WITH REGARD TO HOTELS IN ORBIT

To a large extent, the subject of liability in regard to hotels in orbit includes issues which go beyond the proper scope of this article. This concerns what, in many respects, is the essence of running a hotel, that is, service to be provided to the guests and any damage suffered by them during their stay on a hotel. These issues would, or at least might, well apply also to the rather special (and future) category of hotels in orbit, but are not dealt with here.

At the same time, a hotel in orbit is clearly a quite special category, and, different from terrestrial hotels, is permanently moving relative to earth. As such, a hotel most certainly constitutes a “space object” in the sense relevant for the application of the space treaties, including the Liability Convention.<sup>143</sup> Thus, the space law liability regime, and how it applies to this specific context clearly warrants attention.

Similarly, under the Outer Space Treaty, the state as whose national activities the space hotel operations should be qualified will be held responsible for any violation of relevant space law rules by activities emanating from the hotel and will have to authorize and continuously supervise at least the operation of the hotel itself.<sup>144</sup> This, preferably under such a regime that also governs guests’ individual activities, may equally lead to the international responsibility of the state concerned.

Due to a lack of concrete plans, no specific analysis can be offered yet, but at present, three aspects seem to require further investigation, including the private character of the hotels in orbit, the private nature of the guests, and docking activities.

#### A. The Private Character of Hotels in Orbit

Upon examination of the inclusion of hotels in orbit in the scope of the liability regime as provided by the Liability Convention, the third-party liability regime provided by the Convention first raises the issue of the private character of the operator of the space hotel. This issue

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142. Cf. Stefan Kaiser & Martha Mejia-Kaiser, *Space Passenger Liability*, 2005 PROCEEDINGS OF THE FORTY-EIGHTH COLLOQUIUM ON THE LAW OF OUTER SPACE 207, 210–12; Hobe & Cloppenburg, *supra* note 3, at 382–83.

143. See Liability Convention, *supra* note 38, art. I(d) (as discussed *supra* note 84).

144. See Outer Space Treaty, *supra* note 2, art. VI.

has been discussed in more general terms above,<sup>145</sup> but the quasi-permanent character of hotels in orbit—they would likely be intended to be operational at least for a number of years, if not decades, as opposed to short travels—causes a special situation to arise in practice.

This characteristic of the present form of “private spaceflight” means that the states possibly held liable for damage caused by any activities on a hotel in orbit are, much more than with regard to a “simple” short duration flight, induced to exercise jurisdiction on board these space hotels both by the licensing process and, perhaps, by actual monitoring activities at regular intervals. In other words, the issue of which state is entitled to exercise jurisdiction is of much greater importance for hotels in orbit than it is for short duration flights. Moreover, this should not only concern normal responsibilities and liabilities for operators of a transport activity, but also such things as criminal law and intellectual property rights law.

Suffice it to point out at this stage that the Outer Space Treaty, jointly with the Registration Convention, determines the process. It is the state of registration, which is entitled to “retain jurisdiction and control.”<sup>146</sup> The practice of states to, wherever considered necessary or desirable, extend the scope of specific national legislation to space objects duly registered by means of a specific act confirms that this clause of the Outer Space Treaty does not result in automatic application of *all* national legislation to such space object. The state entitled to register is the launching state, in the case that only one state qualifies to do so. If there is more than one state qualifying as the launching state in regard to a space object, they must decide among themselves which of them would register, which, as mentioned, gains considerable relevance in the case of hotels in orbit.<sup>147</sup>

## B. The Private Character of Guests in Orbit

The private character of the guests should, likewise, be taken into consideration. As described above, there is a desire for states to exercise jurisdiction over hotels in orbit in terms of both regular liabilities and also in terms of criminal law, for example, largely because guests on the hotel would principally not be trained professionals, but paying amateurs.

In addition, the question arises regarding the applicability of the Liability Convention in case the guest—supposedly not coming from the launching state of the hotel in orbit itself—could be directly held to have caused relevant damage. A guest is not a “space object,” so if a

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145. See *supra* Part IV.A.

146. Outer Space Treaty, *supra* note 2, art. VIII.

147. See Outer Space Treaty, *supra* note 2, art. VIII; Registration Convention, *supra* note 96, arts. I(a) & (c), II(1) & (2).

guest is the cause of relevant damage, the Liability Convention would not seem to be applicable since such application is triggered fundamentally by a space object causing damage.

In other words, if such a guest would cause the hotel in orbit, for example, to change orbit and damage another spacecraft, it will still be the launching state of the *hotel*, not of the hotel *guest*, which would be held liable—unless one were to argue that the launching state of the space vehicle bringing the guest to the hotel (such space vehicle clearly being a space object in the sense of the Liability Convention) would lead to a chain of causation (“space object”→“hotel guest”→“presence of guest in hotel”→“guest causing hotel to cause damage”) strong enough to arrive at a determination of liability for the latter launching state, but this seems a rather far-fetched argument. It does show, however, that solid arrangements should one way or another try to exclude as much uncertainty as possible regarding where liabilities may come to reside in relevant cases.

### C. A Special Case: Docking Activities

A special case is presented where spacecraft, whether private or not, dock with the space hotel. The result is a situation where two different types of space objects conduct a *rendez vous*: one, a transport vehicle, and the other, a more permanent part of infrastructure.

Such dockings would potentially lead to damage. Both being space objects, the relevant provisions of the Liability Convention provide for fault liability in case of damage.<sup>148</sup> With two space objects intentionally docking, yet being of such different character, fault may be difficult to establish, however, and the operator of the hotel should not automatically proceed on the assumption that the docking spaceship, the more active and maneuverable of the two, should be held liable. In any case, proper protocols and standard procedures would have to be developed which include clear indications regarding potential liability situations.

## IX. CONCLUDING REMARKS

It is clear that private spaceflight poses great challenges to public space law. In many respects, these challenges are greater than the current ability of national space law to address them. For instance, intricate liability issues arise when private operators are transporting or hosting private passengers (*i.e.*, when no state actor is directly involved). Here, both aviation and high-risk adventure tourism may offer interesting precedents to make up for the inherent limitations of the Liability Convention in this field, which are due to the Liability

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148. See Liability Convention, *supra* note 38, art. III.

Convention's state-oriented character and its exclusive focus on third-party liability and lack of automatically binding dispute settlement procedures.

National law, with its broad experience with contractual liabilities and judicial systems, would offer the appropriate mechanisms to deal with those issues, at least for the time being. For a number of reasons, the United States has taken the lead in this respect. However, in the long run, this does not seem very satisfactory, and the inherent international character of all space activities, including all forms of private spaceflight, may require going beyond national solutions in order to prevent, for example, flags of convenience from appearing in the skies. Only in such a way, it seems, would private spaceflight be able to contribute to the fundamental rule of Article I of the Outer Space Treaty, that "the exploration and use of outer space . . . shall be carried out for the benefit and in the interests of all countries," by lowering the costs of access to outer space in a revolutionary, yet balanced, way on an irreversible basis.