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BEYOND *WHAT?* BEYOND *EARTH ORBIT?...!* THE APPLICABILITY OF THE REGISTRATION CONVENTION TO PRIVATE COMMERCIAL MANNED *SUB-ORBITAL* SPACEFLIGHT

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I. SPACE TOURISM: WHERE ARE WE GOING AND WHAT IS TAKING US THERE?

A. Space Tourism as the Newest Kid on the Block

There is no question that the impending arrival of private commercial manned spaceflight—colloquially, though imprecisely, known as space tourism—presents one of the most challenging issues

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of space law.[1] In principle, it comprises two sorts of space tourism, commonly labeled orbital and sub-orbital.

Orbital space tourism began with Dennis Tito's weeklong visit in 2002 to the International Space Station, which circles the earth at an altitude of some 400 kilometers. Yet, the cost of private orbital flights—in the range of US $20,000,000 to 60,000,000, with the trend being upwards rather than downwards—makes it unlikely that more than a very happy few will be able to make such trips. Moreover, such orbital space tourism is not much of a novelty, as these individuals would visit a public facility on a publicly owned and operated spacecraft.

This article addresses the regulation of private commercial manned spaceflight that is usually labeled sub-orbital. These flights essentially aim to reach an altitude of over 100 kilometers, experiencing a few minutes of weightlessness and the curvature of the earth from outside the atmosphere. Then, the flights return to the place of departure within a few hours at most. This novel phenomenon of flights offered and operated by private operators raises a number of regulatory issues, which may not be readily resolved by existing law.

These concerns begin with the United States,[2] as Virgin Galactic—a company originally from the United Kingdom[3]—is likely

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1. *See generally* Stephan Hobe, *Legal Aspects of Space Tourism*, 86 NEB. L. REV. 439-58 (2007); 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. 1-22 (2005); Jean-François Mayence, *Granting Access to Outer Space: Rights and Responsibilities for States and Their Citizens—An Alternative Approach to Article VI of the Outer Space Treaty, Notably Through the Belgian Space Legislation*, *in* NATIONAL SPACE LEGISLATION IN EUROPE: ISSUES OF AUTHORISATION OF PRIVATE SPACE ACTIVITIES IN THE LIGHT OF DEVELOPMENTS IN EUROPEAN SPACE COOPERATION 73, 95-98 (Frans G. von der Dunk ed., 2011); Frans G. von der Dunk, *Passing the Buck to Rogers: International Liability Issues in Private Spaceflight*, 86 NEB. L. REV. 400-38 (2007).

2. The United States is effectively the only nation-state so far that has actually started to address the issue of commercial manned sub-orbital spaceflight. *See* Commercial Space Launch Act, Pub. L. No. 98-575, 98 Stat. 3055 (1984) (amended 2004), *reprinted in* 1 SPACE LAW: BASIC LEGAL DOCUMENTS E.III.3 (Karl-Heiz Bocksteigel, Marietta Benko & Stephan Hobe eds., 2005); *see also* Commercial Space Launch Amendments Act, Pub. L. No. 108-492, 118 Stat. 3974 (2004) (codified as sections of 49 U.S.C.). The comprehensive regime has now been codified as 51 U.S.C. Chapter 509 and is further elaborated by 14 C.F.R. Chapter III.

to undertake such flights at New Mexico's Spaceport America. Similar flights are being planned elsewhere for the near future. Sweden plans to work with Virgin Galactic to launch such flights from the Kiruna launch site near the polar circle; Space Expedition Corporation (SXC) is going to wet-lease the Lynx vehicle from U.S. manufacturer XCOR to operate in Curacao, a Dutch island in the Caribbean enjoying a status of autonomy;[4] and Space Adventures plans to start operating in the Singapore and Dubai spaceports.[5] Less-developed plans target Scotland, France, Catalonia, and the island of Hokkaido (Japan) as places of takeoffs, whereas other areas of the world have also started showing interest.[6]

B. Conducting Sub-Orbital Operations with Aircraft or Space Objects

In addressing the overriding question of how to handle the unprecedented category of sub-orbital flights legally, which falls somewhere in between classical aviation and classical spaceflight, the discussion has usually centered on whether to apply space law,[7] air law,[8] or some combination of both.[9]

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3. *See Spaceport America*, VIRGIN GALACTIC, http://www.virgingalactic.com/overview/spaceport (last visited Feb. 6, 2013); *see also Our History*, SPACEPORT AM., http://www.spaceportamerica.com/about-us/our-history (last visited Feb. 6, 2013).

4. *See Spaceports*, SPACE EXPEDITION CORP., http://www.spacexc.com/en/spaceports (last visited Feb. 6, 2013). See *About Lynx*, XCOR AEROSPACE, http://www.xcor.com/products/vehicles/lynx_suborbital.html (last visited Feb. 6, 2013), for the background information on Lynx aircraft.

5. *See, e.g.*, *Space Adventures Scouting Potential Locations for Suborbital Spaceport*, SPACE ADVENTURE (Mar. 16, 2004), http://www.spaceadventures.com/index.cfm?fuseaction=news.viewnews&newsid=213.

6. Marc Kaufman, *New Mexico Moves Ahead on Spaceport*, WASH. POST (May 10, 2008), *available at* http://www.washingtonpost.com/wp-dyn/content/article/2008/05/09/AR2008050902508.html.

7. Making a general pitch for space law are, *inter alia*, Ram S. Jakhu & Yaw Otu M. Nyampong, *International Regulation of Emerging Modes of Space Transportation*, *in* SPACE SAFETY REGULATIONS AND STANDARDS 215, 219-20 (Joseph N. Pelton & Ram S. Jakhu eds., 2010); Edith Walter, *The Privatisation and Commercialisation of Outer Space*, *in* OUTER SPACE IN SOCIETY, POLITICS AND LAW 493, 500-01 (Christian Brunner & Alexander Soucek eds., 2011) (briefly discussing space tourism, its history, and its future). *But see* Michael Gerhard, *Space Tourism—The Authorisation of Suborbital Space Transportation*, *in* NATIONAL

It has been often argued that air law should govern because vehicles to be used for sub-orbital flights are deemed sufficiently similar to aircraft. In the context of the international regime established under the auspices of the International Civil Aviation Organization (ICAO), aircraft has been defined as "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."[10] The use of the word "can" points out that, strictly speaking, it is not necessary for a vehicle to actually derive such support for any portion of the flight to qualify as an aircraft, as long as it would at least have had the option to do so. Thus, with the exception of craft that *can only* operate in ballistic mode, all envisaged sub-orbital vehicles would fit the bill, and hence, might entail, at least in principle, application of the aviation law regimes.

At the same time, however, qualification as aircraft does not *ipso facto* exclude a concurrent qualification as space object, which would trigger the applicability of a host of obligations, rights, and rules under space law.[11] While there may be considerable uncertainty as to the precise definition of space object, it may be said to refer essentially to

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SPACE LEGISLATION IN EUROPE 263, 279-88 (Frans G. von der Dunk ed., 2011).

8. *See, e.g.*, Stephan Hobe & Jürgen Cloppenburg, *Towards a New Aerospace Convention? Selected Legal Issues of "Space Tourism"*, *in* PROCEEDINGS OF THE FORTY-SEVENTH COLLOQUIUM ON THE LAW OF OUTER SPACE 377, 378-81 (2005); Peter van Fenema, *Suborbital Flights and ICAO*, 30 AIR AND SPACE L. 396, 399-403 (2005); Ruwantissa Abeyratne, *Space Tourism—Parallel Synergies Between Air and Space Law?*, 53 ZEITSCHRIFT FÜR LUFT- UND WELTRAUMRECHT 184 (2004); Gerhard, *supra* note 7, at 268-78.

9. *See* Frans G. von der Dunk, *The Integrated Approach—Regulating Private Human Spaceflight as Space Activity, Aircraft Operation, and High-Risk Adventure Tourism*, ACTA ASTRONAUTICA (In Press, Corrected Proof), *available at* http://www.sciencedirect.com/science/article/pii/S0094576512002111.

10. Convention on International Civil Aviation, annex VII, 2006, 15 U.N.T.S. 295 [hereinafter Chicago Convention], *reprinted in* AIRCRAFT NATIONALITY AND REGISTRATION MARKS (2003).

11. *See, e.g.*, Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, art. 5, Dec. 19, 1967, 19 U.S.T. 7570 [hereinafter Rescue Agreement]; Convention on International Liability for Damage Caused by Space Objects, arts. I, II-V, Mar. 29, 1972, 24 U.S.T. 2389 [hereinafter Liability Convention].

any man-made artifacts that are intended to be launched into outer space.[12]

Generally, the underlying assumption was that a launch constituted a vertical departure from the earth into outer space using rocket engines. This assumption, however, has been diluted by recent developments, such as the air launches conducted by Pegasus. Here, an airplane leaves the earth in classic aviation mode, and then the proper spacecraft is released from underneath an airplane in mid-air. The airplane takes off from a normal airport runway, and even the initial trajectory of the spacecraft flying independently is essentially a horizontal one. Nevertheless, these activities were legally defined as launches at least for the purpose of space law.[13]

In regards to private commercial manned sub-orbital spaceflight, it still seems to be more appropriate to apply the label of space object to some of the technical/operational concepts under development (such as Blue Origin or Armadillo Aerospace) than to others (such as the Lynx vehicle, an aircraft-like vehicle that is able to take off, traverse the air space, and enter outer space in one seamless operation), with two-stage vehicles (such as Virgin Galactic's WhiteKnightTwo-plus-SpaceShipTwo combination) somewhere in between. However, where the boundary lies between what should be and what should not be considered a space object is far from clear. In fact, there would be good arguments for including even Lynx-types of vehicles within the concept of launch for the simple reason of its intention to reach outer space.[14] In spite of acknowledging that most of the vehicles concerned would also qualify as aircraft, ICAO has so far desisted from actually initiating the development of aviation regulations for manned sub-orbital vehicles.[15] In other words, the

12. *See infra* Section III.B. *Cf.* Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, arts. VII, VIII, Jan. 27, 1967, 18 U.S.T. 2410 [hereinafter Outer Space Treaty].

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

14. *Cf.* MICHAEL CHATZIPANAGIOTIS, THE LEGAL STATUS OF SPACE TOURISTS IN THE FRAMEWORK OF COMMERCIAL SUBORBITAL FLIGHTS 17-25 (2011); Gerhard, *supra* note 7, at 264-65.

15. *Cf. Concept of Sub-Orbital Flights*, §§ 2.2, 5.3, and 6.1 (Int'l Civil Aviation Org., Working Paper No. 12436, 2005); *see also* van Fenema, *supra* note 8, at 400-03.

question of whether to apply air law, space law, or a combination of both to this novel sector is still undecided.

C. Manned Sub-Orbital Spaceflight and the Requirement of Proper International Registration

Two major aspects of such operational/technical characteristics in relation to private commercial manned spaceflight concern the need to guarantee safe re-entry and maximum reusability of the craft concerned.

Prior to the 2004 X-Prize, which launched the first plans for such flights on a commercial basis, the experiences with sub-orbital launches had been limited to scientific or other non-human payloads.[16] In such contexts, safe re-entry was, at least for the vehicles carrying the payloads, often something to be avoided rather than something to be guaranteed.[17] Even if safe re-entry needed to be ensured, all vehicles concerned were expendable; they only needed to survive just one launch and one re-entry.

By contrast, private commercial manned spaceflight needs to be man-rated for re-entry, and the business plans require as many parts of these flights as possible to be used in a safe and commercially feasible manner. Even better, Virgin Galactic has announced plans to use the technology of the SpaceShipTwo, once sufficiently validated by an expanding range of flights, for passenger transportation between two points on the globe.[18] This raises many issues that individual states are unlikely to be able to handle properly. In other words, in the not-

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16. *See, e.g.*, News Release, NASA, NASA Selects Experimental Commercial Suborbital Flight Payloads (Jan. 22, 2013), *available at* http://www.nasa.gov/home/hqnews/2013/jan/HQ_13-027_Commercial_Suborbital_Payloads.html; *see Payload Definition*, MERRIAM-WEBSTER, http://www.merriam-webster.com/dictionary/payload ("[T]he load carried by a vehicle exclusive of what is necessary for its operation...the load carried by an aircraft or spacecraft consisting of things...necessary to the purpose of the flight.").

17. It is *inter alia* for those reasons that in the remainder of this article *non-manned* sub-orbital spaceflight will not be taken into account other than fleetingly.

18. *See Report on the 2006 ECSL Practitioner's Forum*, ECSL NEWSL. N. 33 (European Ctr. for Space Law, Neth.), May 2006, at 3 (reporting on a keynote speech by Mr. Will Whitehorn, then-CEO of Virgin Galactic, at a Practitioners' Forum organized by the European Centre for Space Law (ECSL) at ESA Headquarters in Paris) [hereinafter ECSL NEWSL.].

too-distant future, regulation of such flights can no longer be undertaken by a state on its own; an international overarching legal framework is required.[19] Such international regulation regimes exist and concern, most importantly, international registration and subsequent legal consequences: registration of the craft used would give rise to the entitlement of one state before all others to exercise jurisdiction with respect to such vehicles, the flights they undertake, and anything happening on board, from contracts to accidents and misdemeanors, or worse.[20]

Then, following the aforementioned broader discussion on whether such flights should be handled by air law or space law, the question becomes whether the vehicles to be used for private manned commercial spaceflights should be registered by the states under international space law principles, or under international air law.[21]

II. REGISTRATION: AS AIRCRAFT OR AS SPACE OBJECT?

A. International, European and U.S. Approaches to Regulating Sub-Orbital Spaceflight

As discussed above, many of the vehicles being developed for sub-orbital flights would also qualify as aircraft for the purpose of triggering application of air law. And while ICAO has so far resisted the temptation to try and develop regulation for commercial sub-orbital flights,[22] considerable efforts were initiated in Europe to do exactly that in the field of certification of the vehicles at issue.[23] However, these efforts seem to have been currently shelved as well.

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19. *Cf.* van Fenema, *supra* note 8, at 399-400.

20. *See, e.g.*, Outer Space Treaty, *supra* note 12, Art. VIII; Chicago Convention, *supra* note 10, art. 17.

21. *See, e.g.*, Vladimir Kopal, The 1975 Convention on Registration of Objects Launched into Outer Space in View of the Growth of Commercial Space Activities, in AIR AND SPACE LAW IN THE 21ST CENTURY, 372, 376-85 (Marietta Benkö & Walter Kröll eds., 2001).

22. *See supra* p. 274.

23. The European Aviation Safety Agency (EASA) was established by the European Union (EU) to handle many safety aspects of aviation within the EU Internal Market. *See* Regulation (EC) No 1592/2002 of the European Parliament and of the Council of 15 July 2002 on Common Rules in the Field of Civil Aviation and Establishing a European Aviation Safety Agency, 2002 O.J. (L 240/1); see also

In the United States, efforts to regulate this new sector have taken the space law approach by amending the Commercial Space Launch Act to accommodate *manned* commercial spaceflight in 2004.[24] However, these efforts have been limited to addressing licensing issues (private operators of commercial manned spaceflight should obtain a license under the Act just like private operators of launch vehicles sending satellites into outer space),[25] certain safety and third-party liability-related requirements imposed on licensed operations (by way of such licenses),[26] and the informed consent requirement (which essentially amounts to a waiver of contractual liability *vis-à-vis* passengers).[27]

B. Applying the Registration Convention to Private Commercial Manned Spaceflight

On international registration, by contrast, the verdict is still out. The three flights' clinching victory in the 2004 X-Prize was registered essentially in aviation-mode[28] by the United States on a national level. There was no need, in view of the short and rather up-and-down character of the flights, to register the craft *internationally*, for instance, in conformity with the Chicago Convention.[29] Also, aviation-mode registration of those three flights occurred partly

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Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on Common Rules in the Field of Civil Aviation and Establishing a European Aviation Safety Agency, 2008 O.J. (L 79) 1, for the amendment that repealed the 2002 Regulation. The EASA worked on the development of a specific subset of regulations for sub-orbital vehicles using existing aircraft certification as the point of departure. *But see, e.g.*, Jean-Bruno Marciacq et al., *Accommodating Sub-Orbital Flights into the EASA Regulatory System*, *in* SPACE SAFETY REGULATIONS AND STANDARDS 187-212 (Joseph N. Pelton & Ram S. Jakhu eds., 2010); Hobe & Cloppenburg, *supra* note 8, at 379.

24. *See supra* text accompanying note 2.

25. *See* Commercial Space Launch Act, 51 U.S.C.A §§ 50904, 50905 (West 2010).

26. *But see, e.g.*, *id.* §§ 509014, 50915.

27. *See id.* § 50905(b)(5); *see also* 14 C.F.R. § 460.45 (2007).

28. See *infra* Section V.A., for further details.

29. See Chicago Convention, *supra* note 10, arts. 17-21, for international registration of aircraft, granting aircraft the nationality of the state of registration and consequently allowing that state to exercise quasi-territorial jurisdiction on board.

because there had been no time to develop any alternative, and even the 2004 amendments to the Commercial Space Launch Act had not yet materialized. By contrast, the first truly commercial flight will take place in late 2013 (if no further delays occur), allowing for a more consolidated approach.[30] So far, however, the U.S. authorities have not decided how they are going to address any international registration of such future flights.[31]

In light of the above, international registration of the vehicles to be flown by Virgin Galactic, XCOR/SXC, and other similar aircraft under air law rules, may not seem to be the likely or most appropriate route. However, that does not automatically mean registration of such vehicles as space objects is a foregone conclusion, or even the appropriate course of action.

Starting nevertheless with the assumption that, following from the general space law-approach taken so far by the United States to sub-orbital flight, using the international space law regime would be the default option, such registration would then have to take place in accordance with the 1975 Registration Convention.[32] This Registration Convention is one of the four treaties dedicated to outer space and space activities in the context of the U.N. Committee on the Peaceful Uses of Outer Space,[33] and was, generally speaking, widely ratified.[34]

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30. *See, e.g.*, Irene Klotz, *UPDATE 1-Virgin Galactic Aims to Test Fly Ship in Space This Year*, REUTERS (Feb. 28, 2012), http://www.reuters.com/article/2012/02/28/space-business-idUSL2E8DS0M920120228.

31. This was confirmed in private conversations of the author with officials of the U.S. FAA's Office for Commercial Space Transportation, in first instance responsible for regulating private manned sub-orbital flights.

32. Convention on Registration of Objects Launched into Outer Space, Jan. 14, 1975, 28 U.S.T. 695 [hereinafter Registration Convention].

33. The United Nations Committee on Peaceful Uses of Outer Space (UNCOPUOS) is a committee of the U.N. General Assembly with the task to codify and further develop existing international law with respect to outer space and space activities. *See* G.A. Res. 1348 (XIII), art. 1(a) (Dec. 13, 1958), *available at* http://www.oosa.unvienna.org/oosa/SpaceLaw/gares/html/gares_13_1348.html; International Co-operation in the Peaceful Uses of Outer Space, G.A. Res. 1472 (XIV), art. 1 (Dec. 12, 1959), *available at* http://www.oosa.unvienna.org/oosa/SpaceLaw/gares/html/gares_14_1472.html.

34. The Registration Convention, as of January 1, 2011, included fifty-six state-parties, four state-signatories, and two intergovernmental organizations that have declared their acceptance of rights and obligations under the Convention. *See*

First, if the Registration Convention were to apply or be applicable, registration in a national register would become mandatory even as the details of such a register are completely left at the discretion of the registration state.[35] The state required to register would be the launching State of the space object if only one state qualifies as such, respectively one of the launching States if there would be more than one.[36] It is also here, where the issue of what constitutes a launch referred to earlier become important because the Registration Convention would, by definition, not be applicable if an object at issue is not launched. The registration state is then required to inform the U.N. Secretary-General of the establishment of such a register,[37] and following its registration can claim primary entitlement to exercise jurisdiction on board that space object as well as over the personnel thereof.[38]

Second, registration of such space object with the U.N. under the supervision of the U.N. Secretary-General maintained by the Vienna-based Office of Outer Space Affairs[39] would also become mandatory.

Comm. on the Peaceful Uses of Outers Space, Legal Subcomm, Rep. on its 51st Sess., Mar. 19-30, 2012, U.N. Doc. A/AC.105/C.2 (Mar. 12, 2012), *available at* http://www.unoosa.org/pdf/limited/c2/AC105_C2_2012_CRP03E.pdf. The number of state participants may seem somewhat limited compared to the numbers for the Outer Space Treaty (101, 26, and 0 respectively), the Rescue Agreement (91, 24, and 2 respectively), and the Liability Convention (88, 23, and 3 respectively). However, since the Registration Convention counts at least the large majority of states that actually send space objects into outer space or have substantial capability to do so as its parties, it is still considered that the Registration Convention is a successful treaty. *See also* Frans G. von der Dunk, *The Registration Convention: Background and Historical Context*, *in* PROCEEDINGS OF THE FORTY-SIXTH COLLOQUIUM ON THE L. OF OUTER SPACE 450, 450-53 (2004).

35. *See* Registration Convention, *supra* note 32, art. II.

36. The launching State is defined in relation to the space object subject to the registration requirement in a fourfold fashion allowing, in principle, more than one state to qualify as such for the same space object: "(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." *Id.* art. I(a).

37. *See id.* art. II(1).

38. *See* Outer Space Treaty, *supra* note 12, art. VIII.

39. *See United Nations Office for Outer Space Affairs*, UNOOSA, http://www.unoosa.org/oosa/index.html (last visited Feb. 7, 2013); see *Registration of Objects Launched into Outer Space*, UNOOSA, http://www.unoosa.org/oosa/en/SORegister/index.html (last visited Feb. 7, 2013),

In fact, the Registration Convention does provide for some basic data that should be included in the international register.[40] Obviously, in practice, it also makes sense to require those same data as the minimum for purposes of national registration.

C. The Core Problem with Application of the Registration Convention to Sub-Orbital Flights

However, when it comes to applying the Registration Convention to the envisaged sub-orbital flights, many authors have explicitly stated or implicitly argued that it, under its own terms, cannot and should not be applied to sub-orbital flights such as those contemplated by Virgin Galactic, XCOR/SXC, and the like.[41]

Article II(1) contains the key clause of the Registration Convention formulating the obligation to register space objects, which provides that "[w]hen a space object is launched *into Earth orbit or beyond*, the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain."[42] Sub-orbital vehicles may or may not be included in the definition of space objects; since sub-orbital flights do not complete even one Earth orbit, they fall short of this criterion. Therefore, under the common

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for the access to the registry.

40. *See* Registration Convention, *supra* note 32, arts. III, IV. Art. IV(1) lists the basic data required to be provided.

41. *See, e.g.*, Gerhard, *supra* note 7, at 279-88; *see generally* Jean-Bruno Marciacq et al., *Towards Regulating Suborbital Flights—An Updated EASA Approach*, IAC-10-D2.9.5, (2010) (suggesting the approach to accommodate sub-orbital flights from the perspectives of aeroplanes and their operation); Alexander Soucek, *International Law*, *in* OUTER SPACE IN SOCIETY, POLITICS AND LAW 294, 349 (Christian Brünner & Alexander Soucek eds., 2011) ("[S]uborbital flights . . . neither go into Earth orbit nor beyond; they are not covered by Article 2 of the Registration Convention."); Bernard Schmidt-Tedd & Stephan Mick, Article VIII of the Outer Space Treaty, in 1 COLOGNE COMMENTARY ON SPACE LAW 151 (S. Hobe, B. Schmidt-Tedd & K.U. Schrogl eds., 2010); *Concept of Sub-Orbital Flights*, *supra* note 15, § 3.3. *See also* Kopal, *supra* note 21, at 377 n.13 (stating that "intercontinental ballistic missiles and other objects which have not reached the Earth orbit" would not be subject to registration obligations under the Registration Convention). *But see* Mayence, *supra* note 1, at 98 (being uncertain about such inapplicability).

42. Emphasis added.

interpretation, the Registration Convention, at least as it currently stands, does not apply—nor should it.

Under this interpretation of the scope of the registration requirements under the Registration Convention, the terminology of Article II(1) is effectively seen to refer to three separately distinguishable categories of flights of space objects: (1) those that go to Earth orbit; (2) those that go beyond, which are subject to the key rights and obligations under the Registration Convention; and (3) by way of *a contrario* reasoning, those that neither go *to*, nor go *beyond* one Earth orbit, and thus are to be excluded from the Registration Convention. Put differently, the succinct conclusion that the Registration Convention by referring to "Earth orbit or beyond," comprehensively excludes sub-orbital flights *hinges on the unspoken assumption that the term beyond with respect to Earth orbit and sub as in sub-orbital are simply opposites*.

Unfortunately, there is more to it than that.

III. BACK TO SEMANTICS: THE DEFINITIONS OF BEYOND, EARTH ORBIT AND SUB(-ORBITAL)

A. The Meanings of Beyond and Earth Orbit as Employed by the Registration Convention

Under the Vienna Convention on the Law of Treaties,[43] which is now considered to reflect customary international law,[44] the baseline approach to the proper interpretation of international treaties is to assess "the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose."[45] In other words, to determine the extent of which Article II(1) of the Registration Convention addresses sub-orbital flights, one needs to engage in a detailed semantic analysis of, firstly, the term beyond in this specific context, and, secondly, that of Earth orbit.

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43. Convention on the Law of Treaties, May 23, 1969, 1155 U.N.T.S. 331 [hereinafter Vienna Convention].

44. *See, e.g.*, REBECCA M.M. WALLACE, INTERNATIONAL LAW 233-35 (3rd ed. 1997); ANTONIO CASSESE, INTERNATIONAL LAW 133-35 (2d ed. 2001). For the general information about the Convention, MICHAEL AKEHURST, A MODERN INTRODUCTION TO INTERNATIONAL LAW 121-40 (5th ed. 1984).

45. Vienna Convention, *supra* note 43, art. 31(1).

As to the ordinary meaning of beyond, this is a term normally perceived and explained with reference to a particular *place*, having an essentially spatial, *geographic* connotation. It has, thus, been defined as "on or to the farther side: farther."[46] It is, in other words, a relative determinant of location and assumes the existence of a clear, geographical reference point relative to which the term beyond determines that location.

In other contexts the term beyond might also have been defined in an essentially metaphorical and figurative sense, that is *not* geographically referring to any distinct physical place, in other words as "in addition: besides."[47] However, such a meaning would make no sense in relation to the concept of Earth orbit because Article II (1) of the Registration Convention juxtaposes the two terms. If beyond Earth orbit would mean in addition to Earth orbit or besides Earth orbit, the whole term into Earth orbit or beyond would essentially become superfluous because simply all space activities whether achieving Earth orbit or not, would be included in the scope of the Registration Convention.

Consequently, the term beyond in the present context cannot logically be defined in any other fashion than as a term of a geographical character referring to a certain location. It does so, of course, by reference to Earth orbit for the purpose of delimiting the scope of the Registration Convention.

That, however, begs the question—to what extent Earth orbit could indeed serve as a point of reference for the term beyond that is an essentially geographic concept. First, Earth orbit constitutes a subcategory of the concept orbit, which unfortunately is *not* perceived as a geographical concept, but as an *operational* one. An orbit namely constitutes "the gravitationally curved path of an object around a point in space," completing a 360° circular or ellipsoid trajectory around it.[48] Thus, an Earth orbit would refer to a trajectory, which equates to

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46. *Beyond Definition*, MERRIAM-WEBSTER, http://www.merriam-webster.com/dictionary/beyond (last visited Feb. 8, 2013).

47. *Id.*

48. *See Orbit*, BRITANNICA, http://www.britannica.com/EBchecked/topic/431123/orbit (last visited Feb. 9, 2013) ("[O]rbit, in astronomy, path of a body revolving around an attracting centre of mass, as a planet around the Sun or a satellite around a planet.").

such a path around the earth of satellites or manned spacecraft. Similarly, orbital means achieving at least one such full trajectory.

However, that is also where essentially the commonality of definition of Earth orbit and its derivative term orbital stops. Throughout the history of mankind's activities in outer space, widely different orbits have been used. These range from low-Earth orbits (LEO) for the International Space Station,[49] to medium-Earth orbits (MEO) for GPS,[50] and from highly elliptical and/or polar orbits[51] for remote sensing satellites, to the geo-synchronous/geo-stationary orbit[52] for communication satellites. Thus, for such reasons, Earth orbit cannot possibly serve as a simple *geographic* criterion.

Furthermore, this primary operational distinction brings certain fundamentally different sets of *technical* requirements for launches that cause the payload (usually a satellite) to complete at least one orbit around the earth as compared to launches that may not even have a separate payload and certainly do not complete one orbit around the earth. Indeed, in order for the space object to reach Earth orbit, a launch must achieve an escape velocity of some seven times higher

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49. The International Space Station generally operates at altitudes of some 350 kilometers. *Higher Altitude Improves Station's Fuel Economy*, NASA, http://www.nasa.gov/mission_pages/station/expeditions/expedition26/iss_altitude.html (last visited Feb. 9, 2013). "Low-earth orbits" have been variously defined as comprising ranges of altitudes, usually somewhere between 100 kilometers and 2,000 kilometers. *See, e.g.*, NAT'L AERONAUTICS AND SPACE ADMIN., NASA SAFETY STANDARD GUIDELINES AND ASSESSMENT PROCEDURES FOR LIMITING ORBITAL DEBRIS A-2 (1995), *available at* http://www.orbitaldebris.jsc.nasa.gov/library/NSS1740_14/nss1740_14-1995.pdf.

50. GPS operates in orbits at an altitude of some 20,200 km. *See Space Segment*, GPS.GOV, http://www.gps.gov/systems/gps/space/ (last visited Feb. 10, 2013). "Medium earth orbits" are usually defined as comprising anything between low earth orbits (altitude of 2,000 kilometers) and the geostationary orbits (altitude of 35,786 kilometers). *See Orbit: Definition*, http://gcmd.nasa.gov/add/ancillaryguide/platforms/orbit.html (last visited Feb. 10, 2013); *see also Medium Earth Orbit*, WIKIPEDIA (Nov. 30, 2012), http://en.wikipedia.org/wiki/Medium_Earth_orbit.

51. Such orbits can have "perigees" (lowest points) as little as a few hundred kilometers above the earth's surface and "apogees" (highest points) reaching beyond the geostationary orbit. *See Orbit: Definition*, *supra* note 50.

52. The geostationary orbit is at about 35,786 kilometers above the earth's surface. *See Ask an Astrophysicist*, NASA, http://imagine.gsfc.nasa.gov/docs/ask_astro/answers/970408d.html (last visited Feb. 10, 2013).

than if the intention is to achieve a mere up-and-down trajectory into the edge of outer space. The object launched in the latter case is usually also expected to come back to the earth in the same part of the world:

> If one's goal is simply to "reach space", for example in competing for the Ansari X Prize, horizontal motion is not needed. In this case the lowest required delta-v is about 1.4 km/s, for a sub-orbital flight with a maximum speed of about 1 km/s. . . . Compare this with orbital spaceflights: a low Earth orbit (LEO), with an altitude of about 300 km, needs a speed around 7.7 km/s, requiring a delta-v of about 9.2 km/s. . . . It should be noted that any spaceflight that returns to the surface . . . will undergo atmospheric reentry. The speed at the start of that is basically the maximum speed of the flight. The aerodynamic heating caused will vary accordingly: it is much less for a flight with a maximum speed of only 1 km/s than for one with a maximum speed of 7 or 8 km/s.[53]

In sum, Earth orbit in its ordinary meaning[54] refers to the fact of having completed at least one full orbit around the earth or at least to the *intention* to achieve such orbit. Thus, the terms Earth orbit and orbital essentially refer to an operational/technical criterion instead of a geographic one. Beyond the definitional commonality as an operational/technical concept, geographically speaking, Earth orbit may indeed refer to anything between just over 100 kilometers and almost 40,000 kilometers from the earth's surface.

However, in combining the term with the unequivocal geographic one of beyond, as the Registration Convention clearly does, the non-geographic term Earth orbit now effectively must be interpreted as a geographic one itself. The key phrase of Article II(1) cannot be logically interpreted otherwise; beyond Earth orbit is to be read as above a certain altitude, because this conforms to the ordinary meaning of beyond, whereas any other interpretation of the concept would make no sense in the context of the Registration Convention. This, by the same token, leaves us also with the conundrum of *what*

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53. *Sub-orbital spaceflight*, WIKIPEDIA (Jan. 18, 2013), http://en.wikipedia.org/wiki/Sub-orbital_spaceflight.

54. *See* Vienna Convention, *supra* note 43, art. 31(1) ("A treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in light of its object and purpose.").

set of places Earth orbit would refer to, in view of the major divergence in such orbits in terms of distance from the earth—an issue to which we will return later.[55]

Such a conclusion on the geographic nature of the terminology "into Earth orbit or beyond" is corroborated by the Russian version of Article II (1) of the Registration Convention—another version equally authoritative to the English one.[56] The Russian version states "*на орбиту вокруг Земли или дальше в космическое пространство*," which roughly means "into Earth orbit or *beyond into outer space*."[57] Alternative terms for "beyond" are "farther," "further," "farther away," or "further away."[58]

With respect to the other equally authoritative versions,[59] the French version reads "*sur une orbite terrestre ou au-delà*";[60] "*au-delà*" is translated as beyond.[61] The Spanish version reads "*en órbita terrestre o más allá*,"[62] with "*más allá*" equally translated as beyond.[63] Finally, the Chinese and the Arabic versions are similarly translated.[64]

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55. See *infra* Part VIII.A.

56. Registration Convention, *supra* note 32, at art. XII (referring to "this Convention, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic").

57. *Id.* art. II(1), *available at* http://www.unoosa.org/oosa/ru/SpaceLaw/gares/html/gares_29_3235.html.

58. *See на орбиту вокруг Земли или дальше в космическое пространство Translation*, GOOGLE TRANSLATE, http://translate.google.com/#auto/en/%D0%BD%D0%B0%20%D0%BE%D1%80%D0%B1%D0%B8%D1%82%D1%83%20%D0%B2% ("[I]nto Earth orbit or beyond space"); *see also Beyond Translation*, SDL FREE TRANSLATION.COM, http://www.freetranslation.com/ (translating beyond into "into an orbit around of the Earth *in a space*") (last visited Feb. 9, 2013).

59. *See* Registration Convention, *supra* note 32, art. XII ("[T]his Convention, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic".).

60. *Id.* art. II(1).

61. *See Au-delà Translation*, GOOGLE TRANSLATE, http://translate.google.com/#auto/en/au-del%C3%A0 (last visited Feb. 9, 2013); *see also Au-delà Translation*, SDL FREETRANSLATION.COM, http://www.freetranslation.com/ (last visited Feb. 9, 2013).

62. Registration Convention, *supra* note 32, art. II(1).

63. *See Más allá* Translation, GOOGLE TRANSLATE, http://translate.google.com/#auto/en/m%C3%A1s%20all%C3%A.1.

64. *See* 进入或越出地球轨道时 *Translation*, GOOGLE TRANSLATE,

Thus, the translations neither specifically confirm, nor specifically deny determination of beyond Earth orbit as a determinant of location, and these versions essentially face the same question regarding the provision and its conformity with the foregoing analysis.

B. The Meanings of Sub and Sub-orbital Flight

Next, it is to be investigated what sub-orbital flight really refers to in the absence of the term in the Registration Convention in order to determine whether and how this type of flight would fit within the key requirement of that Convention that only spaceflight "into Earth orbit or beyond" would be susceptible to the relevant registration requirements. Obviously, the analysis must focus on the two elements of the term: 1) sub and 2) orbital.

As to the first element, the prefix sub simply means "under: beneath: and below."[65] In other words, it is essentially a relative determinant of location—a spatial term with reference to a certain geographic place. In this case, the referenced concept is orbit(al), suggesting that a *sub*-orbital flight remains *under* or *below* a place (or at least series of distinct places) called orbit. Thus, the widespread, yet usually unspoken, assumption that almost pollutes a proper understanding is that sub-orbital flights are somehow flights of short duration and short distances because they remain below a certain altitude, place, or area.

This is similar to the term beyond. However, because sub in sub-orbital refers to orbits just as the term beyond in the context of Article II(1) of the Registration Convention refers to Earth orbit, the two terms are actually seen as opposites. That is, of course, precisely how "not in or beyond Earth orbit," as effectively delineating the category of flights *not* falling within the scope of the Registration Convention, came to be generally and unconsciously interpreted as equating with sub-orbital.

Unfortunately, again, there is more to it than that. Take the case of sounding rockets, which have been launched into what clearly

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http://translate.google.com/ (enter 进入或越出地球轨道时; then click "Translate"); وراءه ما أو أرضي مدار على *Translation*, GOOGLE TRANSLATE, http://translate.google.com (enter وراءه ما أو أرضي مدار على; then click "Translate").

65. *Sub Definition*, MERRIAM-WEBSTER, http://www.merriam-webster.com/dictionary/sub (last visited Feb. 8, 2013).

constitutes outer space—to altitudes as high as 1,500 kilometers.[66] They essentially go up and down, then certainly never complete an Earth orbit, and therefore would be presumed non-orbital. Even more pertinent, deep space probes leave the solar system altogether and travel billions of kilometers away from the earth,[67] without ever going orbital around the earth. They go far above any Earth orbit in a geographic sense, so super-orbital would be a better label. Then, should these flights still be deemed sub-orbital or not?

Should sub-orbital, therefore, really be defined in a geographic sense, as remaining sub or below whatever altitude, place, or area the term orbit(al) refers to? Or should it essentially be equated with *non-*orbital as the logical opposite to orbital, referring to the fundamental operational difference where sub should actually be interpreted, instead of its standard geographic sense, in a metaphorical, figurative sense, as falling short of?

One should again note the crucial *technical* differences in so-called escape velocities, which underpin any operational definition of sub-orbital and take into account the intention of many of those flights to achieve certain altitudes:

> For sub-orbital spaceflights covering a horizontal distance the maximum speed and required delta-v are *in between those of a vertical flight and a LEO.* The maximum speed at the lower ends of the trajectory are [sic] now composed of a horizontal and a vertical component. The higher the horizontal distance covered, the more are both speeds, and the more is the maximum altitude. For the V-2 rocket, *just reaching space* but with a range of about 330 km, the maximum speed was 1.6 km/s. Scaled Composites SpaceShipTwo which is under development will have a similar free-fall orbit but the announced maximum speed is 1.1 km/s (perhaps because of engine shut-off at a higher altitude). For larger ranges, due to the elliptic orbit *the maximum altitude can even be considerably more than for a LEO.* On an intercontinental flight, such as that of an intercontinental ballistic missile or possible future commercial spaceflight, the maximum speed is about 7 km/s, and

66. *See Sounding Rocket*, WIKIPEDIA (Jan. 29, 2013), http://en.wikipedia.org/wiki/Sounding_rocket.

67. *See Space Probes*, NAT'L GEOGRAPHIC EDUC., http://education.nationalgeographic.com/education/media/space-probes/?ar_a=1 (last visited Feb. 10, 2013).

> the *maximum altitude about 1200 km*. Note that an intercontinental flight at an altitude of 300 km would require a larger delta-v, that of a LEO.[68]

So, while somehow assuming sub-orbital flights reach outer space only for a short moment, a gliding scale exists between flights that essentially fly on an up-and-down, point-A-to-point-A trajectory, and flights completing (at least) one orbit by point-A-to-point-B true arc trajectory, where A and B are increasingly further apart. This, of course, harkens back to the aforementioned plans of Virgin Galactic to offer the future point-to-point transportation traversing substantial stretches of outer space while considerably falling short of achieving even one full orbit.[69]

As a result of these complexities, the definitions of sub-orbital in relation to the relatively clear concepts of orbit and orbital tend to be confusing and potentially conflicting, particularly as to whether operational, technical, or geographical criteria should ultimately be decisive.

On one end, sub-orbital, following the geographical nature of the prefix sub, has often been defined in an inverse *geographical* fashion, referring to rising *above* a certain altitude, place, or area instead of remaining *below* such altitude, place, or area. One example holds that "a sub-orbital spaceflight reaches an altitude higher than 100 kilometers above sea level";[70] a quite precise geographical criterion that, even before discussing such precision,[71] would easily encompass the aforementioned sounding rockets and deep space probes. Similarly, a V-2 test rocket launched in early 1944 to an altitude of 189 kilometers is listed as the "first sub-orbital space flight" for that very reason.[72]

At the same time, one can assume that the lack of failure to comply with the operational criterion of going orbital is an unspoken, but presumed, prerequisite to fall within this definition. Otherwise,

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68. *Sub-orbital Spaceflight*, WIKIPEDIA (Jan. 18, 2013), http://en.wikipedia.org/wiki/Sub-orbital_spaceflight [hereinafter *Sub-orbital Spaceflight*] (emphasis added).

69. *See supra* Part I.C.

70. *See Sub-orbital Spaceflight*, *supra* note 68.

71. *See infra* Parts VIII.A&B.

72. *See Sub-orbital Spaceflight*, *supra* note 68.

orbital activities would also be included and the term sub-orbital would effectively lose its distinctive meaning. In sum, under this definition, sub-orbital flights would actually comprise of all flights reaching a certain altitude, *yet* not completing even one full orbit around the earth.

On the other end, the United States Code of Federal Regulations (CFR) chapter dealing with commercial *space* transportation defines suborbital trajectory, in a rather straightforward *operational* and *technical* fashion, as "the intentional flight path of a launch vehicle, reentry vehicle, or any portion thereof, whose vacuum instantaneous impact point does not leave the surface of the earth."[73] The technical term vacuum instantaneous impact point is defined as "the point that [the space vehicle] would strike the earth if it were allowed to continue on its current trajectory."[74] Under this definition, sub with respect to sub-orbital indeed does not refer to reaching or not reaching a place or area like outer space, but solely to a failure to achieve a particular operational or technical feat: an orbit around the earth.

Yet, this raises further complications. The aforementioned CFR definition in particular presupposes that there *is* a vacuum instantaneous impact point that "does not leave the surface of the earth."[75] However, if that is the key element of the definition, would deep space probes have to be considered sub-orbital because they do not complete one orbit around the Earth, or not sub-orbital because they travel into outer space without ever returning to Earth, in other words not having *any* vacuum instantaneous impact point on the surface of the Earth just like an orbiting object?

Further definitions distinguish sub-orbital spaceflight from sub-orbital *sub*-space flight, notably aircraft flying hyperbole trajectories, which obviously should not be considered spaceflight at all. Thus, a sub-orbital spaceflight has been determined to constitute "a spaceflight in which the spacecraft *reaches space*, but its trajectory intersects the atmosphere or surface of the gravitating body from

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73. 14 C.F.R. § 401.5 (2012).

74. Rand Simberg, *Permission to Fly*, FOXNEWS.COM (Oct. 15, 2003), http://www.foxnews.com/story/0,2933,10
0181,00.html.

75. 14 C.F.R. § 401.5.

which it was launched, so that it *does not complete one orbital revolution.*"[76]

In conclusion, it would make the most sense to follow the approach taken by the authoritative interpretation of the U.S. government—the only government that has dealt with sub-orbital flight in a legal sense. As a result, the geography, location, or distance of a spaceflight should not be the principal determinant of whether the flight is sub-orbital or orbital (though it should not be completely disregarded).

Ultimately, sub-orbital should be first equated with non-orbital in an operational and technical sense. To the extent geography comes into the definition, it is a secondary threshold for distinguishing sub-orbital spaceflight from other sub-orbital operations. For example, sounding rockets and deep space probes would indeed be clearly sub-orbital *as long as it is understood that this does not say anything about altitudes achieved.* Such sounding rockets and deep space probes fly well above most or indeed all orbits flown by man-made devices around the earth.

However, the concept sub-orbital should no longer carry any unspoken geographical connotation of sub as below a certain place or area. It also should not include any unconscious reference to a short flight or short distances being covered, as the criterion here works in an inverse manner. It does not refer to activities *below* a certain place or area, but to activities reaching *above* a certain place or area. Otherwise, it would inadvertently get in the way of proper understanding, leading to assumptions that sub is simply the opposite of beyond, that sub-orbital mirrors beyond Earth orbit, and consequently that the Registration Convention *by definition* does not apply to any sub-orbital flights.

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76. *See Sub-orbital Spaceflight*, *supra* note 68 (emphasis added); *see also* Sylvia Ospina, *Lessons from "The Little Prince" on Space Flight*, *in* PROCEEDINGS OF THE FORTY-EIGHTH COLLOQUIUM ON THE LAW OF OUTER SPACE 190, 191, 197 n. 13 (2006) ("[S]ub-orbital generally refers to an up-and-down (i.e., mostly vertical) flight that reaches an altitude of around 100km or more, but does not go into orbit around the [E]arth.").

C. Conclusion: Confusion?

In sum, the dichotomy used by the Registration Convention between space objects being launched "into Earth orbit or beyond" and those falling short of that threshold, has apparently, presumably, and unconsciously, yet effectively, been equated to the distinction between orbital and sub-orbital. This has resulted in the presumption that the Registration Convention does not apply to sub-orbital flights.

Analysis, however, has shown that the ordinary meaning given to the terms Earth orbit and beyond only logically refers to a geographic dichotomy. It fundamentally distinguishes between flights that reach the minimum altitude, which is defined as Earth orbit, and flights that do *not* reach that altitude—whatever precise number is to be attached to it. Nevertheless, before finally concluding that not *all* sub-orbital flights should automatically be excluded from the scope of the Registration Convention, but only those that do not go in a geographical sense beyond Earth orbit, some further issues need to be addressed.

First, we should be aware that this would also require properly addressing the complications caused by the involvement of the primarily non-geographical connotation of Earth orbit. *What* orbit should we look to determine what fits in the category of not going beyond one orbit, and what fits into the category of going beyond Earth orbit? Should it be the LEO orbit at a 400 kilometer-altitude? Should it be the MEO orbit at a 20,200 kilometer-altitude? Or, should it be the geostationary one at a 35,786 kilometer-altitude?[77]

Second, in view of the many complexities unearthed by our semantic analysis of the key terms beyond, sub, Earth orbit, and sub-orbital, the analysis of the proper scope of applicability of the Registration Convention should not be simply limited to that of "the ordinary meaning to be given to the terms of the treaty" as Article 31(1) the Vienna Convention on the Law of Treaties requires.

The Vienna Convention in such cases also requires us to look to, in particular, the following questions:

77. *See infra* Parts VIII.A&B.

(1) Do the context, object and purpose of the Registration Convention provide further insight as to whether it should apply to private commercial manned sub-orbital spaceflight?[78]

(2) Would the subsequent practice, in particular in a national legal context, provide further clues as to whether the Convention should apply to such flights?[79]

(3) Do the preparatory works and circumstances surrounding conclusion of the Convention finally provide helpful pointers in this context?[80]

In other words, to what extent would further research corroborate or conversely argue against the conclusion that only sub-orbital flights that do not reach a certain geographic point in outer space would not need to be registered under the Registration Convention?

IV. CONTEXT, OBJECT, AND PURPOSE OF THE REGISTRATION CONVENTION

A. The Context within which the Registration Convention Arose

The Registration Convention, work on which began in 1968,[81] was finalized with its adoption on November 12, 1974, by being annexed to the U.N. General Assembly Resolution 3235(XXIX).[82] It was drafted as an element in a package of treaties targeted at elaborating fundamental legal principles and concepts posited by the

78. *See* Vienna Convention, *supra* note 43, art. 31(1) (referring to "the ordinary meaning to be given to the terms of the treaty").

79. *Id.* art. 32. While it is recognized that registration of space objects in several states may not be a matter spelled out into too much detail in legislation, for efficiency's sake this analysis will limit itself to those national laws and regulations, if any, that testify to a more or less formal authoritative interpretation of the Registration Convention by the state at issue.

80. *Id.* (referring to those as "Supplementary means of interpretation").

81. *See* Manfred Lachs, THE LAW OF OUTER SPACE: AN EXPERIENCE IN CONTEMPORARY LAW-MAKING 72-73 n.17 (Tanja L. Masson-Zwaan & Stephan Hobe eds., 2010).

82. *See* U.N. OFFICE FOR OUTER SPACE AFFAIRS, U.N. TREATIES AND PRINCIPLES ON OUTER SPACE AND RELATED GENERAL ASSEMBLY RESOLUTION, at v, U.N. Doc. ST/SPACE/11/Rev.2, U.N. Sales No. E.08.I.10 (2008); *see also* Registration Convention, *supra* note 32.

Outer Space Treaty,[83] in this case notably Articles V[84] and VIII.[85] It was, therefore, partly seen as a means to back up the clauses of the Rescue Agreement by spelling out obligations to return spacecraft and rescue astronauts, and a means to identify the launching state(s) of relevant space objects under the liability provisions of the Liability Convention.[86]

When addressing the wider, real-world context within which the Registration Convention saw the light of day, it must be realized that even in 1975 history had just witnessed a very limited number of spaceflights altogether. It was less than twenty years since Sputnik I—the first man-made object to leave the earth's atmosphere—had flown; just fourteen years since the first man had flown in outer space; and barely six years since the first of only twelve astronauts had set foot on the moon.[87] All of those flights, moreover, fundamentally concerned one-off trips: a launch, a certain amount of travel through outer space, sometimes a re-entry, and then the museum or a scrap yard for the hardware.

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83. *See, e.g.*, Kopal, *supra* note 21, at 372-76; Bin Cheng, *Space Objects and their Various Connecting Factors*, *in* OUTLOOK ON SPACE LAW OVER THE NEXT 30 YEARS 204-5 (Gabriel Lafferranderie & Daphne Crowther eds., 1997).

84. Outer Space Treaty, *supra* note 12, art. V (referring to "State of registry of their space vehicle," to which stranded astronauts should be "safely and promptly returned"); *see also* Frans G. von der Dunk & Gerardine Meishan Goh, *Article V*, *in* 1 COLOGNE COMMENTARY ON SPACE LAW: OUTER SPACE TREATY 94-102 (Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrogl, 2010).

85. Outer Space Treaty, *supra* note 12, art. VIII ("A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body."). However, the State party retains the right to have its space object returned if found outside its own territory. *See* Schmidt-Tedd & Mick, *supra* note 41, at 146-68.

86. *See also* Registration Convention, *supra* note 32, Annex.

87. *See Sputnik 1*, NASA, http://www.nasa.gov/multimedia/imagegallery/image_feature_924.html (last visited Mar. 31, 2013) ("On Oct. 4, 1957, Sputnik 1 successfully launched and entered Earth's orbit."); *Yuri Gagarin: First Man in Space*, NASA, http://www.nasa.gov/mission_pages/shuttle/sts1/gagarin_anniversary.html (last visited Mar. 31, 2013) ("On that day in 1961, Russian cosmonaut Yuri Gagarin...became the first human in space."); *The First Man on the Moon*, NASA, http://www.nasa.gov/audience/forstudents/k-4/stories/first-person-on-moon.html (last visited Mar. 31, 2013) ("On July 20, 1969, Neil Armstrong became the first human to step on the moon.").

Space activities, moreover, were very much the domain of the United States and the Soviet Union, the two superpowers juxtaposed in the Cold War. While an increasing number of states had space objects operating in outer space by 1975, access to space in terms of launch capabilities was still limited to a handful.[88] Most of the respective allies of the superpowers piggy-backed on their efforts, whereas just a handful of others had developed some measure of independent space-faring capabilities. Most other states were only beginning to understand the potential benefits space capabilities could bring with them. Many of the space activities that did take place were not undertaken by individual states because they were too expensive, technologically demanding, and risky for single-nation efforts. Consequently, many space activities started to take place through the unique cooperative intergovernmental operators such as the European Space Agency,[89] INTELSAT,[90] and INTERSPUTNIK.[91]

Consequently, the regime of space law was geared to both individual state and inter-state activities. Private activities in outer space were hardly envisaged, and to the extent they might nevertheless occur, they were completely subsumed under the state

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88. *See, e.g.*, Gerald M. Steinberg, *Satellite Capabilities of Emerging Space-Competent States*, *available at* http://faculty.biu.ac.il/~steing/military/sat.htm (last visited Mar. 31, 2013) (indicating that only certain states had the capabilities to develop and launch satellites until the 1980s).

89. The European Space Agency (ESA) was established by the Convention for the Establishment of a European Space Agency, art. 1, Dec. 31, 1975, 1297 U.N.T.S. 161. This Convention actually integrated two prior existing European space organisations: ELDO (as per the Convention for the Establishment of a European Organization for the Development and Construction of Space Vehicle Launchers, London, Mar. 29, 1962, 507 U.N.T.S. 177) and ESRO (as per the Convention for the Establishment of a European Space Research Organization, June 14, 1962, 158 U.N.T.S. 35).

90. INTELSAT was established by the Agreement Relating to the International Telecommunications Satellite Organization, Aug. 20, 1971, 23 U.S.T. 3813, and the Operating Agreement Relating to the International Telecommunications Satellite Organization, Aug. 20, 1971, 23 U.S.T. 4091. In fact, it had already operated prior to 1971 as "Interim-INTELSAT" based on the satellite system of the U.S. operator COMSAT, which was established by the Communications Satellite Act, Pub. L. No. 87-624, 76 Stat. 419.

91. INTERSPUTNIK was established by the Agreement on the Establishment of the "INTERSPUTNIK" International System and Organization of Space Communications, Nov. 15, 1971, 862 U.N.T.S. 3.

responsibility and state liability regime of the treaties preceding the Registration Convention.[92]

Equally important, international space law was very much geared towards orbiting satellites, which at the time constituted the bulk of operational experience with outer space. One relatively limited exception consisted of sounding rocket activities, but those were simple in nature, of short duration, and usually confined in their actual and potential impact to a single territory and airspace.

Intercontinental ballistic missile launches at the time may have presented the only type of sub-orbital activity that was realistically relevant.[93] However, because of their military nature and the unwillingness of the two superpowers, the United States and the Soviet Union, to deny themselves the option of using such missiles, they had been carved out from the general prohibition on the use in space of nuclear weapons,[94] and obviously those superpowers would never have accepted subsuming the missiles under the requirement to register under the Registration Convention.

Finally, no reusable space vehicles (whether manned or unmanned), such as those planned to be used for private commercial sub-orbital spaceflight, were yet on the horizon. Furthermore, safe re-entry was only important to the extent (exceptionally) astronauts or (somewhat less exceptionally) valuable cargo were involved—as well as in the specific context of liability, where damage caused on Earth by a re-entering space object would lead to absolute and unlimited liability as opposed to fault liability ruling in outer space.[95] As said, all spaceflight experience in any event was so far of a one-off nature.

Thus, the general context within which the Registration Convention was drafted, seems to suggest that the possibility of non-military flights of space objects operated by private entities on a recurring or frequent basis was not foreseen. Particularly, it was not foreseen as far as manned spaceflight was concerned, which not only

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92. See Outer Space Treaty, *supra* note 12, arts. VI, VII; Liability Convention, *supra* note 10, arts. I-V, VIII.

93. *See* Kopal, *supra* note 21, at 377 n.13 (referring to "intercontinental ballistic missiles and other objects which have not reached the Earth orbit" as not being subject to registration obligations under the Registration Convention).

94. See Outer Space Treaty, *supra* note 12, art. IV(1), for an *a contrario* interpretation.

95. *See* Liability Convention, *supra* note 11, arts. II, XII.

disallowed any burning up in the atmosphere during a re-entry, but required the reuse of its vehicles as often as safely possible.

Would it be too far off to conclude at this stage that the introduction of the phrase "into Earth orbit or beyond" in the Registration Convention might well have been a mere refinement of the terminology in(to) outer space used by the preceding space treaties?[96] Would this perhaps have been done with no other intention other than carving out from the Registration Convention both ballistic missiles and the potentially myriad parts of a launched space object that fall apart before ever getting close to outer space?[97] Could deep space probes and other non-orbital launches be more or less safely disregarded because of their one-off, limited character? Deep space probes are anyway supposed to leave the solar system altogether after a short crossing of Earth orbits, so the low risk of accidents might have justified the exclusion from the Registration Convention's scope. Finally, precisely because of their one-off limited character, it would, in any event, be easy to identify the responsible and liable states when international ramifications would unexpectedly arise.

B. The Main Objective and Purposes of the Registration Convention

The Registration Convention took a comprehensive approach to its own objectives and purposes. The main approach was authoritatively described as "to fix a legal link between the object launched into outer space and the launching State on whose registry this object is carried in order to secure jurisdiction and control over such object."[98] This would "also enable to answer the question which State—or international organization—is responsible for a particular space activity and eventually liable for damage caused by such object."[99]

In principle, there is no reason why this approach should not apply to sub-orbital space objects intended to reach outer space. In fact, the Rescue Agreement and the Liability Convention, which handle such

96. *See, e.g.*, Outer Space Treaty, *supra* note 12, arts. VI-IX,; Rescue Agreement, *supra* note 11, art. 5(3).

97. For further corroboration on the statement of the Canadian representative to COPUOS on the "cluttering" of the register, see *infra* Part VI.B.

98. Kopal, *supra* note 21, at 375; *see also* Abeyratne, *supra* note 8, at 200.

99. Kopal, *supra* note 21, at 375; *see also* Abeyratne, *supra* note 8, at 200.

jurisdiction and control issues as well as attendant liabilities, addressed, in principle, *all* objects intended to be launched into outer space, not just those intended to be launched into Earth orbit.[100] The full title of the Registration Convention refers to the "Registration of Objects Launched into Outer Space," without any further *caveat* as to how long or how far that space object should actually be in outer space; any object launched would, in principle, be subject to its regime. This is further corroborated by provisions of the Preamble that refers to "international responsibility for their national activities in outer space," echoing the state responsibility of Article VI of the Outer Space Treaty and referring to "objects launched into outer space."[101]

By contrast, of course, Article II of the Registration Convention qualifies this triggering concept of launch by its additional reference to "into Earth orbit or beyond."[102] Article V also uses the same qualifying term "into Earth orbit or beyond" when referring to the possibility of marking a space object with a designator or registration number.[103] More elaborately, the information that the state of registration under the Registration Convention would have to provide for the international registry includes "[b]asic orbital parameters, including: (i) Nodal period; (ii) Inclination; (iii) Apogee; (iv) Perigee," which clearly presume that some type of orbit is achieved.[104] States are likewise explicitly required (albeit qualified by the phrase "to the greatest extent feasible and as soon as practicable") to notify the U.N. "of objects concerning which it has previously transmitted information, and which have been, but no longer are, in Earth orbit."[105] In order not to unduly fill the registry with launches that do not result in a space object reaching "into Earth orbit or beyond," registration was effectively envisaged as an *ex post facto* activity as

100. *See, e.g.*, Rescue Agreement, *supra* note 11, art. 5; Liability Convention, *supra* note 11, arts. II-V.

101. *See* Registration Convention, *supra* note 32, pmbl., §§ 2, 5.

102. *Id.* art. II.

103. *Id.* art. V.

104. *Id.* art. IV(1)(d)i-iv. All these terms are typical and determinative parameters of a circular or elliptic earth orbit.

105. *Id.* art. IV(3).

far as the international register was concerned; the data required is to be furnished "as soon as practicable."[106]

Clearly, the Registration Convention's reference to "into Earth orbit or beyond" intended to, and therefore legally does, address particular space objects launched "into Earth orbit or beyond" and *not* space objects falling short of that threshold. As analyzed, however, this should not be equated with non-applicability of the Registration Convention to all *sub-orbital* space objects because the threshold should be presumed to be geographic.

The broader context of the Registration Convention becomes relevant again at this point. Article VIII of the Outer Space Treaty by its phrasing "on whose registry" suggests, rather than requires, registration. However, it proceeds to link that registration to "an object launched *into outer space*," not necessarily into an Earth orbit or beyond.[107]

The close link between Article VIII of the Outer Space Treaty and the Registration Convention demands the interpretation of any deviation between the Treaty and Convention in a limited fashion. As Schmidt-Tedd and Mick observe:

> The *ratio legis* of Article VIII of the Outer Space Treaty and of the REG [Registration Convention] however, calls for a wide interpretation.... The main purpose of Article VIII of the Outer Space Treaty and of the REG is to enable the identification of a space object, thus allowing the identification, at any time and in each individual case, of the State that is responsible for the particular space object and ... liable for damages caused by the object.[108]

Neither the state responsibility under Article VI of the Outer Space Treaty, nor the state liability under Article VII thereof and the Liability Convention, for which the Registration Convention provides an important identification mechanism, is limited in any fundamental sense to activities respectively space objects in Earth orbit or beyond.

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106. *Id.* art. IV(1)(c-d) (requiring "[d]ate (...) of launch" (sub (c)) and actual "[b]asic orbital parameters"). This could even mean after achieving orbit only.

107. Outer Space Treaty, *supra* note 12, art. VIII (emphasis added).

108. Schmidt-Tedd & Mick, *supra* note 41, at 154.

A next pointer comes from the generic term space object as it triggers the applicability of the Registration Convention.[109] The term space object has been defined by the Registration Convention only in a summary fashion, and partly as a circular argument at that: "[t]he term 'space object' includes component parts of a space object as well as its launch vehicle and parts thereof."[110] To further clarify the rather wanting definition of space object, authoritative opinion generally holds that a key element in any proper definition of a space object is that it is launched into outer space—not, for example, into Earth orbit.[111]

In turn, launch has been defined as including "attempted launching."[112] In other words, a launch vehicle at issue need not have actually *reached* outer space or Earth orbit, or even have lifted from the launch pad to trigger relevant provisions of space law. The main objective of the Registration Convention, therefore, seems to be to include as many launched space objects as practically relevant by referring to those "launched into Earth orbit or beyond" while excluding those where that was attempted but never realized.

Furthermore, it should be noted that the largely unconscious *de facto* focus of the Registration Convention on expendable launch vehicles has resulted in an almost automatic equation of registration of space objects with the registration of their particular launches. International registration of a space object requires information on "[d]ate and territory or location of launch," which suggest one launch per space object.[113] Yet, the Registration Convention formally and

109. *Cf.* Registration Convention, *supra* note 32, art. II(1-2) ("Where there are two or more launching States in respect of *any such space object*, they shall jointly determine which one of them shall register the object.") (emphasis added).

110. *Id.* art. I(b).

111. *See id.* pmbl., arts. II, V (using either "launched into outer space" or "launched into Earth orbit or beyond"); *see also id.* arts. I, II & IV (referring to "launching" and "launching State"); Kopal, *supra* note 21, at 377; Schmidt-Tedd & Mick, *supra* note 41, at 150-51. Furthermore, it may be noted that the Liability Convention, preceding the Registration Convention by only a few years, had used an identical definition of "space object." *See* Liability Convention, *supra* note 11, art. I(d).

112. Registration Convention, *supra* note 32, art. I(b).

113. *Id.* art. IV(1).

explicitly calls for the registration of *space objects*, not of individual *launches*.[114]

As long as sub-orbital launches were one-off occasions, such as deep space probes or sounding rockets, this differentiation would remain theoretical. Similarly, the likelihood of international ramifications in terms of responsibility and liability could be deemed minimal; this is what the Registration Convention was concerned with. The question remains whether "into Earth orbit or beyond" was merely an effort to be more precise than the concept into outer space, with the intent to carve out only those spaceflights that would not cause international ramifications. Thus, the analysis of the main purpose of the Convention does not decisively determine whether all sub-orbital objects are to be excluded from the scope of the Convention for the reasons of not reaching the threshold of "into Earth orbit or beyond."

V. THE PRACTICE IN IMPLEMENTING THE REGISTRATION CONVENTION

A. United States Practice

When addressing the practice in implementing the Registration Convention as a further tool to help understand the proper scope of the Registration Convention *vis-à-vis* sub-orbital spaceflight, in particular manned sub-orbital spaceflight (at least as viewed by relevant states), the first point of note is that, apart from the United States, there has been very little practice in terms of flying commercial manned spacecraft. As the leading nation today both in space activities generally and in commercial manned sub-orbital spaceflight particularly, special attention should indeed be paid to the practice of the United States relative to the implementation, application and interpretation of the Registration Convention, to which it is an original party.[115]

However, until Virgin Galactic and/or other companies start their operations, factual practice even in the United States remained limited to three flights of the SpaceShipOne vehicle back in 2004, to prepare

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114. *Id.* art. II.

115. *See Treaty Signatures*, UNOOSA, http://www.unoosa.org/oosatdb/showTreatySignatures.do (last visited Feb. 10, 2013) (search "Registration Convention," "United States of America," and "Party").

for, then win the X-Prize, and for those the United States explicitly opted for an *ad hoc* approach. Such limited practice should qualify the value of any analysis thereof with the view to interpret the Registration Convention.

The ad hoc approach, for instance, meant that the first permit for a manned sub-orbital flight was provided under the Commercial Space Launch Act[116] for a *series* of *space launches*.[117] At the same time, in terms of national registration it meant that both SpaceShipOne and its carrier aircraft WhiteKnight were registered as experimental *aircraft* and not as space objects.[118] The SpaceShipOne was, thus, adorned in aircraft-mode with the Federal Aviation Administration (FAA) registration number N 328 K (328 K referred to the 328,000 feet that was the intended altitude for winning the X-Prize).[119] At the time, it was planned to have the SpaceShipTwo vehicles, which are going to undertake the Virgin Galactic flights from the United States, registered as spacecraft, while simultaneously using the same aviation-reminiscent mode under the number N 400 K (400,000 feet being the intended maximum altitude for the flights).[120]

Beyond that factual practice, the only practice that might shed some light on the issue concerns legislative and regulatory practice with a view to future flights. In the United States there is no actual statute regulating registration of space objects. Instead, the State Department takes care of such registration on an international level based on information provided by other branches of the U.S. government and "the official U.S. Registry of Space Objects Launched into *Outer Space*"—that is, *not* formally limited to objects "launched into Earth orbit or beyond."[121] Such registration, however,

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116. *See* 51 U.S.C.A. §§ 50904, 50905 (West 2010).

117. *Cf. e.g.*, Patrick-Andre Salin, *US Space-Related Rules Adopted in 2003-2004*, 29 AIR & SPACE L. 373, 384 (2004); van Fenema, *supra* note 8, at 398-99.

118. *See* van Fenema, *supra* note 8, at 399.

119. *See* ECSL NEWSL., *supra* note 18, at 2; *see also* van Fenema, *supra* note 8, at 399-400. *But see Concept of Sub-Orbital Flights*, *supra* note 15, at § 3.3.

120. *See* ECSL NEWSL., *supra* note 18, at 3.

121. *See Space and Advanced Technology*, U.S. DEP'T STATE, http://www.state.gov/e/oes/sat/index.htm (last visited Feb. 10, 2013); *see also* U.S. SPACE OBJECTS REGISTRY, http://www.usspaceobjectsregistry.state.gov/ (last visited Feb. 10, 20130) (emphasis added).

has not taken place with respect to any private sub-orbital flights as of yet.[122]

The FAA is then required to assist the State Department in ensuring licensees will provide the appropriate information, which is essentially the same as that of Article IV(1) of the Registration Convention and applies to "all objects *placed in space* by a licensed launch."[123] Notably, the impending private commercial manned sub-orbital spaceflights will have to be licensed by the FAA, suggesting that they will also be subsumed under this regime, and that the absence of registration of sub-orbital vehicles launched May, to say the least, not be a very principled or legally mandated one.

In terms of reusable space vehicles, the United States launched five space shuttles for a total of 135 times between 1981 and 2011, with one catastrophic launch failure and one catastrophically unsuccessful re-entry.[124] Out of those launches, 124 launch events were notified to the United Nations for registration purposes.[125] This was perhaps because they resulted in the completion of at least one orbit before attaching to the ISS (their most frequent target); this has not been formally clarified. It would be a matter of conjecture whether the space shuttle itself would have been seen as completing orbits while attached to the ISS, but we will not digress on this issue.

It might be noted that in spite of the reusability of at least the orbiter-part of each launch constellation, the United States effectively reported *each launch event*. However, the orbiter itself, certainly in terms of size, constituted a minor element of the launch constellation while the expendable boosters represented the bulk of the constellation. Thus, it can be presumed that essentially each time a new shuttle launch took place, that shuttle was not considered a space object that had previously flown, despite the fact that it was comprised of a key component part that had previously been in outer space.

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122. *See infra* notes 127-128 and accompanying text.

123. 14 C.F.R. § 417.19 (2006) (emphasis added).

124. *See* NASA, SPACE SHUTTLE LAUNCHES, *available at* http://www.nasa.gov/pdf/537939main_ss-launches-080311.pdf.

125. *See Online Index of Objects Launched into Outer Space*, UNOOSA, http://www.unoosa.org/oosa/showSearch.do (search "United States of America" for State/Organisation, "STS" for Launch Vehicle, and "Space Shuttle" for Spacecraft Type) (last visited Feb. 23, 2013).

The FAA has confirmed that, for the time being, no decision has been made as to whether the vehicles planned to be launched from spaceports within the United States will be registered under the Registration Convention (presumably in view of the fact that international ramifications in terms of space law-responsibility and law-liability are unlikely to arise in view of the flight profiles) or under the aircraft registration regime (presumably in view of the fact that in all other respects the FAA has so far treated the vehicles concerned as launch vehicles, in spite of the registration number of SpaceShipOne).[126] In the author's view, it will consequently be more likely that they will *not* be registered under the Registration Convention, at least not until further notice.

Following such an expressed indecision specifically on *manned* sub-orbital vehicles, it is not necessary at this stage to investigate the presumed absence of registration of *unmanned* sub-orbital craft under the Registration Convention. Suffice it to state here that while practice in the United States so far would seem to favor registration of orbital space objects only, formally speaking, nothing would seem to stand in the way (at least as far as the national regulations would be concerned) of registering manned sub-orbital space objects as well, under the Registration Convention or otherwise.

Finally, it is worth noting that the United States routinely notifies the United Nations every few months of all the space objects having been launched or having experienced fundamental changes compared to previously transmitted information. There is a standard heading in those notifications reading: "The following objects were launched since the last report but did not achieve orbit,"[127] which would be the most sensible place to refer to sub-orbital flights if it would indeed be the intention to register them. As indicated, however, neither the first flight of the SpaceShipOne in June 2004, nor the two X-Prize winning flights in September and October of that year,[128] found their way into these notifications under such a heading (or indeed otherwise).[129]

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126. Interview with John Sloan & Laura Montgomery, Officials of the U.S. Office of Commercial Space Transp., in Wash. D.C. (Mar. 30, 2012).

127. *See, e.g.*, Comm. on the Peaceful Uses of Outer Space, Legal Subcomm. Rep. Aug. 26, 1998, U.N. Doc. ST/SG/SER.E/344 (1998).

128. *See SpaceShipOne*, WIKIPEDIA, http://en.wikipedia.org/wiki/SpaceShipOne (last visited Feb. 23, 2013).

129. See U.N. Secretariat, Information Furnished in Conformity with the

Thus, the U.S. practice, limited as it has been in the first place, does not provide any clear-cut guidance as to an official, authoritative U.S. interpretation of the Registration Convention with respect to the issue at hand. However, the *de facto* focus on orbital objects at least seems to suggest a *de jure* focus on those would be the most likely one, once the United States would take a more formal and explicit stance on the issue. At the same time, this practice also seems to have been focused very much on expendable vehicles instead of re-usable vehicles. The major exception of the space shuttle flights, in addition to information about the registration following launch, refers to a "document of decay or change" as if it were a satellite, or a document which could be a different document altogether, in particular if the return of the space shuttle took place a long time after its launch and docking with the ISS.[130]

B. The Practice of Other States With a National Space Law

A summary analysis of relevant provisions of other states' more or less comprehensive national space laws that deal with private commercial space activities delivers the following results. It may be noted at the outset that all states concerned as of now are parties to the Registration Convention.[131] However, none of them have so far had any independent experience with sub-orbital manned spaceflight or spaceflight involving reusable vehicles. Even in Soviet times, all manned spaceflight was essentially orbital (although it now seems Gagarin, in his historic 1961 flight, fell some 900 kilometers short of completing a full orbit),[132] whereas the Soviet version of a reusable

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Convention on Registration of Objects Launched into Outer Space, Annex, Comm. on the Peaceful Uses of Outer Space, U.N. Doc. ST/SG/SER.E/453 (Aug. 3, 2004), *available at* http://www.unoosa.org/pdf/reports/regdocs/ser453E.pdf, for relevant events in June 2004; see also U.N. Secretariat, Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space, Annex, Comm. On the Peaceful Uses of Outer Space, U.N. Doc. ST/SG/SER.E/458 (Dec. 13 2004), *available at* http://www.unoosa.org/pdf/reports/regdocs/ser458E.pdf, for relevant events *inter alia* in September and October 2004; van Fenema, *supra* note 8, at 399; *Concept of Sub-Orbital Flights*, *supra* note 15, at § 3.3.

130. *See Online Index of Objects Launched into Outer Space*, *supra* note 125.

131. *See generally Treaty Signatures*, *supra* note 115.

132. *See* FRANCIS FRENCH, COLIN BURGESS & PAUL HANEY, INTO THAT SILENT SEA—TRAILBLAZERS OF THE SPACE ERA, 1961-1965 29 (2007).

space shuttle, the Buran, flew unmanned only once. Thus, practice here exclusively refers to legislative practice, which has so far remained theoretical in application.

The Norwegian Act on Launching[133] applies to "launch[ing] any object *into outer space*;"[134] however, as this Act does not address registration as such—in part, because it dates back to 1969 when the Registration Convention was barely in its infant stages—this particular formulation should probably not be given too much weight. Norway signed on to the Registration Convention much later in 1995, but still has not registered any space objects, orbital or sub-orbital.[135]

The case of Sweden is, therefore, more interesting. Not only does Sweden—like Norway—have considerable experience with sounding rockets, launched from Kiruna above the polar circle, but it has explicitly *excluded* the "launching of sounding rockets" from the concept of "space activities" under the 1982 Swedish Act on Space Activities.[136] Furthermore, on the issue of registration the attendant

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133. Act on Launching Objects from Norwegian Territory into Outer Space, No. 38, June 13, 1969 [hereinafter Norwegian Act on Launching], *available at* http://www.unoosa.org/oosaddb/showDocument.do?documentUid=324&level2=none&node=NOR1970&level1=countries&cmd=add; *see also* Frans G. von der Dunk & Atle Nikolaisen, *Vikings First in National Space Law: Other Europeans to Follow—The Continuing Story Of National Implementation Of International Responsibility And Liability*, *in* PROCEEDINGS OF THE FORTY-FOURTH COLLOQUIUM ON THE LAW OF OUTER SPACE 111-21 (2002).

134. Norwegian Act on Launching, § 1 (emphasis added).

135. *See* Registration Convention, *supra* note 32.

136. § 1 LAG OM RYMDVERKSAMHET [ACT ON SPACE ACTIVITIES] (SFS 1982:963) (Swed.), *available at* http://www.unoosa.org/oosa/SpaceLaw/national/sweden/act_on_space_activities_1982E.html ("Nor is Launching of sounding rockets designated as space activities."); Jurgen Reifarth, *Nationale Weltraumgesetze in Europa [National Space Laws in Europe]*, 36 ZEITSCHRIFT FÜR LUFT- UND WELTRAUMRECHT 3, 11 (1987) (Ger.); *see also* Niklas Hedman, *Swedish Legislation on Space Activities*, *in* NATIONALES WELTRAUMRECHT / NATIONAL SPACE LAW: DEVELOPMENT IN EUROPE—CHALLENGES FOR SMALL COUNTRIES, 73-80 (Christina Brünner & Edith Walter eds., 2008); I. Marboe & F. Hafner, *Brief Overview over National Authorization Mechanisms in Implementation of the UN International Space Treaties*, *in* 1 NATIONAL SPACE LEGISLATION IN EUROPE: ISSUES OF AUTHORISATION OF PRIVATE SPACE ACTIVITIES IN THE LIGHT OF DEVELOPMENTS IN EUROPEAN SPACE COOPERATION 29, 34 (Frans G. von der Dunk ed., 2011) ("The Swedish Act . . . prescribes a license for non-governmental space activities . . . lays down the conditions under which a license may be issued . . . establishes the national register for space objects required by the Registration

Decree on Space Activities summarily states that "[t]he National Board for Space Activities shall keep a register of the space objects for which Sweden is to be considered the launching State in accordance with Article 1 of the Convention on Registration of Objects Launched into Outer Space of 14 January, 1975."[137] Then, the decree simply copies the provisions of Article IV(1) of the Registration Convention on the items to be included in that register, which includes the same "basic orbital parameters" required by Article IV(1) of the Registration Convention.[138]

The explicit exception for the launching of sounding rockets under the Swedish Act on Space Activities has meant that no sounding rockets were included in the seventeen Swedish space object launch notifications to the United Nations under the Registration Convention.[139] On the contrary, it could also be argued that without that explicit exception, such activities would have been subject to the Registration Convention's requirements as implemented through the Swedish Decree on Space Activities. This would certainly confirm that sub-orbital space activities, even if this concerns unmanned ones, would not merely by that token be excluded from the scope of the Registration Convention.

In any event, a conscious decision had been made to specifically exclude them from the scope thereof, having to do at least partially with the perceived one-off, short-duration, and up-and-down character[140] of sounding rocket launches. Whether space objects to be launched *repeatedly* into sub-orbital trajectories would be necessarily excluded is, therefore, a question that remains to be answered.

Convention . . . .").

137. § 4 FORORDNING OM RYDVERKSAMHET [DECREE ON SPACE ACTIVITIES] (SFS 1982:1069) (Swed.), *available at* http://www.oosa.unvienna.org/oosaddb/showDocument.do?documentUid=319&country=SWE.

138. *Id.*; Reifarth, *supra* note 136.

139. *See United Nations Register of Objects Launched into Outer Space: Notifications from Sweden (Launch Year 1976-Present)*, UNOOSA, http://www.unoosa.org/oosa/en/Reports/docssweden.html (last visited Feb. 23, 2013).

140. It means they would normally land in the same area as where they were launched.

The United Kingdom's 1986 Outer Space Act[141] also harks back to the Registration Convention, providing that "[t]he Secretary of State shall maintain a register of space objects" and that "[t]here shall be entered in the register such particulars of such space objects as the Secretary of State considers appropriate to comply with the international obligations of the United Kingdom."[142] Thus, the statute leaves the matter essentially undecided as to what particular clauses of the Convention actually were taken to mean in the present context, but it does not distinguish between orbital and non-orbital space objects.[143]

Upon its return to the People's Republic of China (PRC), the region of Hong Kong transferred most of the provisions of the formerly applicable United Kingdom's Outer Space Act into a specific Ordinance in 1997.[144] Also with respect to registration, although the obligation has obviously shifted to PRC authorities, its substantive terms are essentially identical to those applicable under the United Kingdom's Outer Space Act.[145]

Next in line to the United Kingdom's Outer Space Act, chronologically speaking, is Russia's Law on Space Activities, dating back to 1993.[146] On registration, the Russian Law on Space Activities

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141. Outer Space Act, 1986, c. 38 (U.K.) [hereinafter U.K. Outer Space Act], *available at* http://www.legislation.gov.uk/ukpga/1986/38/pdfs/ukpga_19860038_en.pdf; Reifarth, *supra* note 136, at 12; *see also* Sa'id Mosteshar, *Regulation of Space Activities in the United Kingdom*, *in* NATIONAL REGULATION OF SPACE ACTIVITIES 357, 359-62 (Ram S. Jakhu ed., 2010); Marboe & Hafner, *supra* note 136, at 35-36.

142. U.K. Outer Space Act, §§ 7(1)&(2).

143. *Id.*

144. Outer Space Ordinance, (1997) Cap. 523 (H.K.) [hereinafter Hong Kong Outer Space Ordinance], *reprinted in* 2 NATIONAL SPACE LEGISLATION OF THE WORLD 403 (2002); Susanne U. Reif, *Space Law in the People's Republic of China—Hong Kong Special Administrative Region (HKSAR) Government: Outer Space Ordinance (last amended 55 of 1999 s.3)*, 51 ZEITSCHRIFT FÜR LUFT- UND WELTRAUMRECHT 47, 50 (2002) (Ger.). *See generally id.* at 47-56; Yun Zhao, *Satellite Application and Development of Space Law in Hong Kong*, *in* 2004 SPACE LAW CONFERENCE ASSEMBLED PAPERS 107-17 (2004).

145. *Compare* Hong Kong Outer Space Ordinance, § 9, *with* U.K. Outer Space Act, § 7.

146. Law of the Russian Federation "About Space Activity" 1993, No. 5663-1 [hereinafter Russian Law on Space Activities], *available at* http://www.unoosa.org/oosa/en/SpaceLaw/national/russian_federation/decree_5663-

applies to all "space objects of the Russian Federation," which presumably includes those operated by private Russian entities. It allows Russia to maintain jurisdiction and control in accordance with Article VIII of the Outer Space Treaty over such space objects *inter alia* "at any stage of a space flight or stay in outer space"—that is *not* necessarily limited to spaceflights reaching into Earth orbit or beyond.[147] Also other articles of the Russian Law on Space Activities refer to "space activities" without limiting those to activities "in orbit or beyond."[148]

In the case of South Africa, registration of space objects is addressed by the Space Affairs Act, which was also enunciated in 1993.[149] South Africa only recently acceded to the Registration Convention on January 27, 2012.[150] This means that the South African Council for Space Affairs established by the Act has to take care of registration as part of its duties to "supervise and implement matters arising from international conventions, treaties and agreements concerning space affairs entered into or ratified by the Government of the Republic."[151]

Interestingly, the Act then, firstly, applies in general *inter alia* to launching activities, and this would, by the above token, extend to registration issues.[152] Secondly, the Act defines "launching" as "the

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1_E.html; *see also* Sergey P. Malkov & Catherine Doldirina, *Regulation of Space Activities in the Russian Federation*, *in* NATIONAL REGULATION OF SPACE ACTIVITIES 315, 316, 321 (Ram S. Jakhu ed., 2010); Marboe & Hafner, *supra* note 136, at 42-43.

147. Russian Law on Space Activities, arts. 17(1)&(2). *But see id.* art. 9(2) (subjecting space activity to licensing procedures).

148. *See, e.g.*, *id.* arts. 1-4, 9.

149. Space Affairs Act 84 of 1993 (S. Afr.) [hereinafter South African Space Affairs Act], *reprinted in* 1 NATIONAL SPACE LEGISLATION OF THE WORLD 413 (2001); *see also* Justine Limpitlaw, *Regulation of Space Activities in South Africa, in* NATIONAL REGULATION OF SPACE ACTIVITIES 267, 275, 280-81 (Ram S. Jakhu ed., 2010); Marboe & Hafner, *supra* note 136, at 44-5; Izak De Villiers Lessing, *South Africa: Recent Development in Space Law*, 1 TELECOMM. & SPACE J. 139, 139-49 (1994).

150. *See* U.N. Secretary-General, Depository Notifications: Convention on Registration of Objects Launched into Outer Space (Jan. 27, 2012), http://treaties.un.org/doc/Publication/CN/2012/CN.47.2012-Eng.pdf.

151. South African Space Affairs Act, § 5(3)(c).

152. *See id.* § 11(1) (concerning the licensing regime and subjecting launching activities to licensing procedures).

placing or attempted placing of any spacecraft *into a sub-orbital trajectory or into outer space*, or the testing of a launch vehicle or spacecraft in which it is foreseen that the launch vehicle will lift from the Earth's surface."[153] Thus, the South African Space Affairs Act reflects an interpretation of sub-orbital as a geographic concept, namely as *not* reaching "into outer space," which is, as seen, the inverse from the ordinary meaning of sub-orbital (space)flight as at least *reaching* outer space.[154]

The Ukrainian Law on Space Activities was promulgated in 1996, and handles registration largely along the same lines as the Russian Law on Space Activities.[155] Thus, "[s]pace facilities [are] subject to mandatory State registration in the State Register of Objects of Space Activity of the Ukraine," and "space activity" is not explicitly or otherwise formally limited to activities "in Earth orbit or beyond," or sub-orbital.[156]

As for Australia, part 5 of the Space Activities Act of 1998 is dedicated to the registration of space objects.[157] The registration

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153. *Id.* § 1.

154. In spite of the definition of a sub-orbital trajectory under the U.S. C.F.R. Chapter 400 as discussed, *supra* Part III.B, which is of an operational/technical character, the definition of "launch" under the same Chapter as well as in the Commercial Space Launch Act has an operational/technical character, and seems to imply that "sub-orbital" is considered the opposite of "into outer space"—a geographic criterion along the lines suggested by the South African Space Affairs Act.

155. Ordinance of the Supreme Soviet of Ukraine, on Space Activity, 1996 No. 502/96-BP (hereinafter Ukrainian Law on Space Activities), *available at* http://www.unoosa.org/oosa/en/SpaceLaw/national/ukraine/ordinance_on_space_activity_1996E.html; *see* Nataliya R. Malysheva, *Regulation of Space Activities in the Ukraine*, *in* NATIONAL REGULATION OF SPACE ACTIVITIES 335, 335-355 (Ram S. Jakhu ed., 2010); Michael Gerhard, *The Law of Ukraine on Space Activities*, 51 ZEITSCHRIFT FÜR LUFT- UND WELTRAUMRECHT 57, 57-59 (2002); Marboe & Hafner, *supra* note 136, at 43-44.

156. Ukrainian Law on Space Activities, § 13; see also art. 1, for definitions, and arts. 2-4, 10, for licensing of private operators.

157. *Space Activities Act 1998* (Cth) (Austl.) (hereinafter Australian Space Activities Act), *available at* http://www.comlaw.gov.au/Details/C2004C01013; *see also* Noel Siemon & Steven Freeland, *Regulation of Space Activities in Australia*, *in* NATIONAL REGULATION OF SPACE ACTIVITIES 37, 40, 44-57 (Ram S. Jakhu ed., 2010); Steven Freeland, *Difficulties of Implementing National Space Legislation Exemplified by the Australian Approach*, *in* "PROJECT 2001 PLUS"—GLOBAL AND

requirements pertain to any "space object that is launched into Earth orbit or beyond," faithfully reiterating the corresponding clause of the Registration Convention.[158] At the same time, "launch" of a space object is defined as the "launch [of] the object into an area beyond the distance of 100 km above mean sea level, or attempt to do so."[159]

In other words, unless these provisions should be interpreted as internally contradicting, it seems that the Australian legislators equate altitudes of over 100 kilometers with "into Earth orbit or beyond," meaning that flights not achieving the operational/technical feat of fully orbiting the Earth would still be included as long as achieving an altitude of 100 kilometers or more.

In Brazil, the Edict of 2001 and its Launch Regulation applicable to licensing private launch activities refers to registration largely in a different context.[160] Only the very last provision, providing that "AEB [the Brazilian Space Agency] shall maintain a specific registry preferably computerised, for the purposes of registration of licenses for carrying out space launching activities on Brazilian territory," comes close to addressing the requirements under the Registration Convention, but provides far too little specifics to be helpful.[161]

At the same time, however, the references in the Brazilian legislation to launching are rather noteworthy. The Brazilian Launch Regulation refers to "the set of actions associated with the launching

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EUROPEAN CHALLENGES FOR AIR AND SPACE LAW AT THE EDGE OF THE 21ST CENTURY 70-84 (Stephan Hobe et al. eds., 2006); Marboe & Hafner, *supra* note 136, at 45-46; Ricky J. Lee, *The Australian Space Activities Act: Creating a Regulatory Regime for Space Activities*, 25 AIR AND SPACE L. 57-61 (2000).

158. Australian Space Activities Act, § 76(2). Likewise, the specific information to be inserted in the register includes the same "basic orbital parameters" as required under Art. IV(1) of the Registration Convention.

159. *Id.* § 8.

160. See Portarai Aeb [Administrative Edict], No. 27, Regulation on Procedures and on Definition of Necessary Requirements for the Request, Evaluation, Issuance, Follow-up and Supervision of Licenses for Carrying out Launching Space Activities on Brazilian Territory, art. 7 [hereinafter Brazilian Launch Regulation], *available at* http://www.oosa.unvienna.org/pdf/spacelaw/national/natlegE.pdf (enabling "[c]ommercial registration" of companies); *id.* art. 8 (concerning "[r]egistration (...) in the appropriate trade association."); see also Jose Monserrat Filho, *Regulation of Space Activities in Brazil*, *in* NATIONAL REGULATION OF SPACE ACTIVITIES 61, 68-80 (Ram S. Jakhu ed., 2010), for the general information regarding the Edict and Launch Regulation.

161. Brazilian Launch Regulation, art. 27.

of satellites and other kinds of orbital and *sub-orbital* payloads, by means of launch vehicles,"[162] while the ensuing Authorization Regulation refers to "the operation to place or attempt to place a launching vehicle and its payload in *sub-orbital* trajectory, in Earth orbit or *otherwise in outer space.*"[163] Following this, the latter Regulation actually does provide for the AEB to "establish and maintain a registry book for the registration inscription of space objects launched *into outer space* from Brazilian territory," which is interpreted by Monserrat Filho "that Brazil had decided to fulfill the requirements of the Registration Convention."[164] Apparently, the textual and conceptual confusion at the level of the Registration Convention itself has also found its way into this particular domestic context, setting off sub-orbital against orbital and, at another instance, setting off sub-orbital against in(to) outer space.

The registration of space objects in Belgium is arranged by Chapter V of the 2005 Belgian Space Law.[165] The national register is to contain "all space objects for which Belgium is the launching State";[166] "space objects" is defined as comprising "any object launched or intended to be launched *into outer space.*"[167] The term "launching State" is defined with reference to the definitions of the space treaties, disregarding any distinction between orbital and sub-orbital flights.[168] In principle, therefore, the Belgian Space Law would

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162. *Id.* art. 1.

163. Monserrat Filho, *supra* note 160, at 75 (emphasis added); *see also* Regulation of procedures for authorizing space launching operations from the Brazilian territory, Administrative Edict No. 5 (Feb. 21 2002), *reprinted in* Monserrat Filho, *supra* note 160, at 71.

164. Monserrat Filho, *supra* note 160, at 73 (emphasis added).

165. Wet van 17 september 2005 met betrekking tot de activiteiten op het gebied van het lanceren, het bedienen van de vlucht of het geleiden van ruimtevoorwerpen [Law on the Activities of Launching, Flight Operations or Guidance of Space Objects] of Sept. 17, 2005, BELGISCH STAATSBLAD [B.S.] [Official Gazette of Belgium], Nov. 4, 2008, 19517 [hereinafter Belgian Space Law]; *see also* Mayence, *supra* note 1, at 118-21; Marboe & Hafner, *supra* note 136, at 36-37.

166. Belgian Space Law, art. 14(1). The "launching State" is, of course, the entity under the Registration Convention required to arrange registration. *See* Registration Convention, *supra* note 32, art. II(1).

167. Belgian Space Law, art. 3(1) (emphasis added); *see also id.* art. 3(5).

168. *See id.* art. 3(11) (explicitly referring to Article VII of the Outer Space

apply regardless of whether such space objects are intended to achieve Earth orbit.

On the other hand, the clause on the national register explicitly requires this to be "in accordance with the Convention on Registration of Space Objects."[169] Moreover, the Belgian Space Law also refers to the "main orbital parameters" enumerated in Article IV of the Registration Convention, when it comes to items to be included in the register, which suggests that Belgium is of the view that the Registration Convention only applies to space objects achieving at least one orbit.[170]

For South Korea, the Space Development Promotion Act, also enunciated in 2005, handles the registration issues.[171] Following the general applicability of the Act to space objects "designed and manufactured for use *in outer space*,"[172] the provisions on domestic registration refer to any person who "intends to launch a space object."[173] The list of items to be inserted in the domestic register, unlike most other national acts, does *not* refer to any "basic orbital parameters"—only, *inter alia*, to "the basic trajectory of the space object," which can, of course, include any sub-orbital trajectory.[174] On the other hand, specific reference is also made to converting a preliminary registration into a permanent one within 90 days after entry of the satellite into its orbit.[175] After domestic registration, South Korea will then register the space object concerned with the United Nations "in accordance with the Convention on Registration of

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Treaty, Article I(c) of the Liability Convention, and Article I(a) of the Registration Convention).

169. *Id.* art. 14(1).

170. *Id.* art. 14(2)(2)(d).

171. Uju kaebal jinheung beob [Space Development Promotion Act], Act No. 7538, May 31, 2005, *amended by* Act No. 8714, Dec. 21, 2007 (S. Kor.), *translated in* 33 J. OF SPACE L. 175, 175-190 (2007) [hereinafter Korean Space Development Promotion Act]; *see also* Y. Lee, *A Review of the Space Development Promotion Act of the Republic of Korea,* 33 J. OF SPACE L. 123-90 (2007); Marboe & Hafner, *supra* note 136, at 47.

172. Korean Space Development Promotion Act, art. 2(c) (emphasis added).

173. *Id.* art. 8(2).

174. *Id.* art. 8(3)(e).

175. *See id.* art. 8(5), Korean Space Development Promotion Act; *see also* Lee, *supra* note 171, at 127, 157-63.

Objects Launched into Outer Space" without a further indication as to whether South Korea considers the Registration Convention to be applicable to sub-orbital vehicles or not.[176]

The Netherlands promulgated its Space Law in 2007.[177] The registry established by the Dutch Space Law should contain "information concerning space objects that are being used in connection with space activities."[178] "Space activities" is defined as "the launch, the flight operation or the guidance of space objects *in outer space*."[179] Such information shall, according to the accompanying Explanatory Memorandum, include at least the parameters required by Article IV of the Registration Convention—the specific "basic orbital parameters" listed there.[180] The ensuing Order of the Minister of Economic Affairs of February 7, 2008, which contains rules on license applications, likewise requires such orbital parameters to be provided on the registration form.[181] In other words, Dutch space law maintains the clear focus of the Registration Convention on orbiting objects only, excluding in principle all sub-orbital objects without, however, specifically *mentioning* them.

France followed suit with its Law on Space Operations within a year after the Netherlands.[182] The provision on registration simply

176. Korean Space Development Promotion Act, art. 9(1).

177. Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects, 80 Stb. 2007, p. 1 [hereinafter Dutch Space Law]; *see also* Marboe & Hafner, *supra* note 136, at 37-38; H. de Brabander-Ypes, The Netherlands Space Law—An Introduction to Contents and Dilemma's, Presentation at the 47th session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space, *available at* http://www.oosa.unvienna.org/pdf/pres/lsc2008/pres-02.pdf.

178. Dutch Space Law, § 11(1) (emphasis added).

179. *Id.*

180. *See* Space Activities Act: Explanatory Memorandum, § I.3.2 (Neth.).

181. *See* Order of the Minister of Economic Affairs dated 7 February 2008, no WJZ 7119929, Containing Rules Governing Licence Applications for the Performance of Space Activities and the Registration of Space Objects, Annex II, *available at* http://www.oosa.unvienna.org/oosa/en/SpaceLaw/national/state-index.html (Neth.).

182. Loi 2008-518 du 3 juin 2008 relative opérations spatiales [Law 2008-518 of June 3, 2008 on Space Operations], JOURNAL OFFICIEL DE LA REPUBLIQUE FRANCAISE [J.O.] [OFFICIAL GAZETTE OF FRANCE], June 4, 2008 [hereinafter French Law on Space Operations], *translated in* 34 J. OF SPACE L. 453 (2008); *see also* Philippe Achilleas, *Regulation of Space Activities in France*, *in* NATIONAL

echoes the Registration Convention by calling for registration "in the event France has a registration obligation according to Article II" of the Convention, without specifying or indicating how France itself envisions the scope of that Article with a view, for example, to sub-orbital flights.[183]

Finally, Austria is the latest state with a national space law fundamentally addressing private space activities with the Austrian Outer Space Act being adopted as recently as December 2011.[184] The provisions on the registry apply to "[a]ll space objects for which Austria is considered to be the launching State according to Art I of the Convention on Registration of Objects Launched into Outer Space."[185] Interestingly, no reference is made here to Article II(1) of the Registration Convention with its limitation to objects launched into Earth orbit or beyond.[186] Nevertheless, the information to be provided does explicitly include all "main orbital parameters" known from Article IV(1) of the Registration Convention.[187]

At the same time, also in the case of Austria, a "space object" is defined as "an object launched or intended to be launched into *outer space*" without any reference to "Earth orbit or beyond."[188] Moreover, in any event the reference to an intention makes clear that

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REGULATION OF SPACE ACTIVITIES 109, 109-12 (Ram S. Jakhu ed., 2010); Philippe Clerc & Francois Cahuzac, *Advance in the Implementation of the French Space law on Space Operations in the Launcher Field*, *in* PROCEEDINGS OF THE INTERNATIONAL INSTITUTE OF SPACE LAW 400-06 (2009); Marboe & Hafner, *supra* note 136, at 39-40; A. Kerrest de Rozavel & F.G. von der Dunk, *Liability and Insurance in the Context of National Authorisation*, *in* NATIONAL SPACE LEGISLATION IN EUROPE: ISSUES OF AUTHORISATION OF PRIVATE SPACE ACTIVITIES IN THE LIGHT OF DEVELOPMENTS IN EUROPEAN SPACE COOPERATION 125, 155-61 (Frans G. von der Dunk ed., 2011).

183. French Law on Space Operations, art. 12.

184. BUNDESGESETZ ÜBER DIE GENEHMIGUNG VON WELTRAUMAKTIVITÄTEN UND DIE EINRICHTUNG EINES WELTRAUMREGISTERS [AUSTRIAN FEDERAL LAW ON THE AUTHORISATION OF SPACE ACTIVITIES AND THE ESTABLISHMENT OF A NATIONAL SPACE REGISTRY] [hereinafter Austrian Outer Space Act], *available at* http://www.iislweb.org/docs/2011_galloway/AustrianOuterSpaceAct.pdf.

185. *Id.* art. 9(2).

186. *See generally* Austrian Outer Space Act.

187. *See id.* art. 10(1)(4).

188. *Id.* art. 2(2) (emphasis added).

actual achievement of an orbit is not required for the Act to become applicable.

C. Preliminary Conclusions Regarding Implementation Practice

Thus, an analysis of state practice in the implementation of the Registration Convention, non-comprehensive as it may still be, would give rise to a provisional conclusion that most states tend to simply follow the lead of the Registration Convention without much further elaboration when it comes to sub-orbital flights, even if it leads, upon closer view, to internal inconsistencies or even contradictions. They sometimes refer to space objects, objects launched into space, or similar concepts, and sometimes specifically to space objects launched into Earth orbit or beyond, without specifying how and where they perceive sub-orbital flights to fit into this scheme. Thus, no further unequivocal clues are provided here as to *what* types of flights that should be labeled sub-orbital, the Convention is supposed to exclude.

Many states essentially avoided the issue altogether, which simply reflects the lack of realization at the time the Convention was drafted that private commercial manned spaceflight, in particular of a sub-orbital nature, might eventually become a possibility (at least for the respective state concerned).

Moreover, in those cases where apparently the issue of sub-orbital flight *was* somehow addressed by national legislation, legislators seem by contrast to tend to include at least in principle flights reaching outer space regardless of achieving orbit by taking an essentially geographical approach. A key example concerns the clauses in the Australian Space Activities Act effectively referring to a 100 kilometers upper boundary of airspace,[189] although its effect is, in a sense, annulled by an inverse clause in the South African Space Affairs Act referring to "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"[190] as defining the altitude where a state's

189. *See Space Activities Act 1998* (Cth) s 8 (Austl.) [hereinafter Australian Space Activities Act], *available at* http://www.comlaw.gov.au/Details/C2004C01013.

190. Space Affairs Act 84 of 1993 § 1 (S. Afr.) [hereinafter South African Space Affairs Act], *available at* http://download.esa.int/docs/ECSL/SAfrica2.pdf.

jurisdiction fundamentally changes in character[191] and separating sub-orbital launches from launches into outer space—even if both are considered launches.[192] Similar confusion arises with respect to Brazil, where reference is made to "sub-orbital payloads"[193] and "sub-orbital trajectory."[194] Also, the case of South Korea is interesting because it does *not* copy the specific list of requirements of Article IV(1) of the Registration Convention.[195]

The conclusions to be drawn here again are not unequivocal. In the end, a proper uniform and universally accepted interpretation of the Registration Convention as either including some or excluding all sub-orbital objects cannot be derived from implementation of the Registration Convention at the national level. It may be noted here that three out of the four states mentioned above—Australia, Brazil and South Korea—actually have operational launch sites on their respective territories, whereas South Africa for a few years had such a site for test rockets. Such practical involvement, of course, tends to make the practice of these countries considerably more relevant than that of others.

VI. PREPARATORY WORKS AND CIRCUMSTANCES SURROUNDING CONCLUSION OF THE CONVENTION

A. The Travaux Préparatoires of the Registration Convention

Before finally trying to arrive at a conclusion on what the Registration Convention appears to apply to, based on the basis of textual interpretation, analyses of context, object and purposes, and evaluation of its implementing practice, let us first address the *travaux*

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191. *See infra* Part VIII.

192. *See* South African Space Affairs Act, § 1.

193. Portarai Aeb [Administrative Edict], No. 27, Regulation on Procedures and on Definition of Necessary Requirements for the Request, Evaluation, Issuance, Follow-up and Supervision of Licenses for Carrying out Launching Space Activities on Brazilian Territory, art. 1(1), *available at* http://www.oosa.unvienna.org/pdf/spacelaw/national/natlegE.pdf.

194. Authorization Regulation as quoted in Monserrat Filho, *supra* note 160, at 75.

195. *See* Uju kaebal jinheung beob [Space Development Promotion Act], Act No. 7538, May 31, 2005, art. 8(3)(e) *amended by* Act No. 8714, Dec. 21, 2007 (S. Kor.), *translated in* 33 J. OF SPACE L. 175, 175-190 (2007).

préparatoires and the circumstances surrounding the conclusion of the Registration Convention, at least in a succinct fashion, to see whether this might provide further clues.

Soon after the conclusion of the Outer Space Treaty in 1967, work indeed started in earnest on what would later become the Registration Convention, as part of the aforementioned package deal comprising the future Rescue Agreement and Liability Convention. Also, the Registration Convention was intended to elaborate particularly (in this case) the provisions of Articles V and VIII of the Outer Space Treaty that deal with registration of space objects and attendant jurisdiction of the registration state over space objects and anyone on board.

B. The French and Canadian Drafts: "into Space"

Already in June 1968 France proposed a first draft text. The proposal foresaw a registration obligation for "*[a]ny* object launched into space for the exploration and use of outer space."[196] Such registration did not require any specific information related to orbital or other trajectories, and therefore was meant to be comprehensive as to addressing all space objects, not just orbital ones and those going beyond.[197]

This draft was discussed in COPUOS in June 1969, where amongst others the U.S. representative did not (yet) find any fault with using the term "objects launched into outer space" as such.[198] While the Canadian representative did not object to this formulation either, he questioned whether satellites sent into space for "only a few orbits," as well as "space objects in solar orbits or deep in outer space, and . . . objects designed for a more or less permanent landing on other celestial bodies" should indeed come to be included within the scope of the regime—without, it may be noted, referring to the term

196. France: Proposal—Draft Convention Concerning the Registration of Objects Launched Into Space for the Exploration and Use of Outer Space, art. 1, U.N. Doc. A/AC.105/C.2/L.45 (June 18, 1968) [hereinafter French Draft], *reprinted in* 3 MANUAL ON SPACE LAW 603 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

197. *Cf. id.* art. 2.

198. U.N. GAOR, 112th mtg. U.N. Doc. A/AC.105/C.2/SR.112 (June 11, 1969), *reprinted in* 3 MANUAL ON SPACE LAW 643-45 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

sub-orbital as that term also did not find its way into any draft text either.[199]

The French representative expressly defended the proposal as meant "to ensure that *every object launched into space*" was properly registered.[200] In the ensuing discussion, the representatives of six other states briefly commented on the proposal, but none of them raised the issue of this particular phrasing.[201] Yet, in the first Canadian reaction we can already discern the reflection of a desire to focus more on what really required regulation, as opposed to theoretical comprehensiveness of which clearly not all consequences for the future could be foreseen in such a rapidly developing area as that of space activities.

The next substantive proposal for a draft not accidentally therefore came courtesy of Canada, in 1972, and would require "[t]ransit and orbit description" as well as "[e]xpected operational pattern" to be included in the registration entry.[202] Though thereby indeed more specifically focusing on the reality of the predominantly orbital character of both existing and envisaged space operations,[203] the Canadian proposal still left open the possibility to also include flights falling short of achieving orbit in the scope of the convention proposed.

When the French and Canadian proposals were then combined in one draft, the general approach to registering each space object was

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199. U.N. GAOR, 113th mtg. U.N. Doc. A/AC.105/C.2/SR.113 (June 12, 1969), *reprinted in* 3 MANUAL ON SPACE LAW 647 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

200. U.N. GAOR, 115th mtg. U.N. Doc. A/AC.105/C.2/SR.115 (June 13, 1969), *reprinted in* 3 MANUAL ON SPACE LAW 648 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

201. *See id.*, *reprinted in* 3 MANUAL ON SPACE LAW 650-51 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

202. Canada: Draft Convention on Registration of Objects Launched into Outer Space, art. II(1), U.N. Doc. A/AC.105/C.2/L.82 (Apr. 4, 1972), *reprinted in* 3 MANUAL ON SPACE LAW 608-09 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981); see also *id.*, for additional requirements under the Canadian draft proposal.

203. *See id.* art. III(2) ("States with advanced space monitoring and tracking capabilities and facilities agree to provide the Secretary-General, whenever feasible, with relevant 'in-orbit' data on space objects and predictions about decaying orbits and times and places of re-entry.").

maintained at first.[204] The information items to be inserted into the register again were fairly general in nature, comprising "[g]eneral function and expected operational pattern," "[t]rajectory characteristics, including transit and orbit description," and "expected ... re-entry trajectory."[205]

These formulations were maintained in the discussions in the COPUOS working group for a considerable time afterwards.[206] The Canadian representative, for example, "was particularly pleased that there was no objection to the idea of providing the Secretary-General with information on objects *launched into space*."[207] He also pointed out the difference with the text circulated on behalf of the U.S. government, where for the first time (as for the discussions on the draft Convention), the phrase "into Earth orbit or beyond" was coined, arguing that nevertheless "responsibility should also be defined with regard to sub-orbital rockets. On the other hand, one could ask whether the register should be *cluttered* with objects that aborted or were destroyed when a mission was prematurely terminated."[208]

In particular these last remarks, for the first time using the term sub-orbital, seem to confirm that comprehensive applicability of the Registration Convention to space objects not achieving orbit would mainly have to be avoided in order *not* to have to include the potentially myriad parts of a launched space object not making it in one piece to orbital altitudes, which would result in such cluttering. Also, it is clear from the last Canadian statement that sub-orbital was to be juxtaposed to "into Earth orbit or beyond" and for that reason perhaps to be excluded—without however properly indicating how those terms were to be explained or defined.

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204. *See* Canada and France: Proposal—Draft Convention on Registration of Objects Launched into Outer Space, Art. II(1), U.N. Doc. A/AC.105/C.2/L.83 (Apr. 20, 1972), *reprinted in* 3 MANUAL ON SPACE LAW 611 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

205. *Id.* arts. V(1); see *id.*, for other registered space objects.

206. See 3 MANUAL OF SPACE LAW 616, 618-19 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981), for the formulations under Articles V, VII, and VI.

207. U.N. GAOR, 187th mtg. U.N. Doc. A/AC.105/C.2/SR.187 (May 2, 1972), *reprinted in* 3 MANUAL ON SPACE LAW 669 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

208. *Id.*, *reprinted in* 3 MANUAL ON SPACE LAW 670 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

C. The U.S. Draft: "into Earth Orbit or Beyond"

Those same remarks of the Canadian representative, however, reflected a turning of the tide in definitively focusing more on real issues of practice as opposed to more theoretical ones. Thus, the U.S. Draft of March 1973 for the first time formally proposed limitation of space objects to be registered to those which were "launched into Earth orbit or beyond,"[209] in addition using the term basic orbital parameters and specifying those as including nodal period, inclination, apogee and perigee.[210] Canada and France at first responded with a new version of their joint Draft sticking to their earlier formulation of the scope of the registration requirement, while conceding on the issue of parameters to be provided for the register by being a bit more specific on the trajectory characteristics, which now explicitly "includ[ed] nodal period, inclination, apogee and perigee."[211] In other words, the underlying assumption *was* that all objects launched into outer space *ipso facto* would go orbital, and such orbital parameters could always be provided.

Then, however, France also used the term "launched into Earth orbit or beyond" in a new proposal for Article II,[212] which was maintained in the comprehensive version of the Draft Convention of 20 April 1973.[213] It was explained that the use of this terminology reflected the one used in Resolution 1721 (B)(XVII), which already in 1961 provided for a legally non-binding registration regime of

209. United States of America: Proposal—Convention on the Registration of Objects Launched into Outer Space, art. II(1), U.N. Doc. A/AC.105/C.2/L.85 (Mar. 19, 1973), *reprinted in* 3 MANUAL ON SPACE LAW 622 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

210. *Id.* art. IV(1)(d).

211. *See* Canada and France: Proposal for a Convention on Registration of Objects Launched into Outer Space, arts. II(1) & V(1), U.N. Doc. A/AC.105/C.2/L.86 (Mar. 27, 1973), *reprinted in* 3 MANUAL ON SPACE LAW 625, 627 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

212. French Draft, *supra* note 196, art. II(2).

213. *See* Draft Convention on Registration of Objects Launched into Outer Space, art. II(1), U.N. Doc. A/AC.105/115 (Apr. 20, 1973), *reprinted in* 3 MANUAL ON SPACE LAW 632 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981); see also *id.* art. III(1)(d), for "basic orbital parameters."

launched objects.[214] This specific formulation was also taken over by the joint Argentine, Brazilian, Mexican and Sudanese proposal,[215] winding up in the version adopted by the Legal Subcommittee of COPUOS, together with the reference to the basic orbital parameters,[216] and maintained in the Convention itself.

No specific debate seems to have taken place on why the U.S. proposition ultimately prevailed over the original French/Canadian one. The Canadian representative only hinted in general terms at the reasons for agreeing to the U.S. formulation when stating that "the Canadian-French proposal had modified the provisions of the draft which had emerged at the previous session so as to make them less onerous for launching States."[217]

But he also added: "it would be very foolish not to make provision for review in the light of subsequent technological developments."[218] This meant admitting the likelihood that provisions of the then-draft might require updating in due time, to appropriately adapt to new technologies and related developments—the most important of which would come to be that of private commercial manned reusable vehicle technologies for sub-orbital flight.

Nevertheless, the Convention itself, for what may be seen as essentially pragmatic reasons, retained the phrase "into Earth orbit or beyond." The largest issue then seems to have been the difficulty in

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214. *See* G.A. Res. 1721(XVI) B, ¶ 1, U.N. GAOR, 16th Sess., U.N. Doc A/5026, at 6 (Dec. 20, 1961), *available at* http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/1721(XVI)&Lang=E&Area=RESOLUTION.

215. *See* Argentina, Brazil, Mexico, Sudan: Proposal—Draft Convention on Registration of Objects Launched into Outer Space, art. III bis, U.N. Doc. A/AC.105/C.2/L.94 (May 10, 1974), *reprinted in* 3 MANUAL ON SPACE LAW 635 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981) (marking "each space object launched into earth orbit or beyond" with the international designator and registration number).

216. *See* Draft Convention on Registration of Objects Launched into Outer Space, arts. II(1) & IV(1), U.N. Doc. A/AC.105/133 (June 6, 1974), *reprinted in* 3 MANUAL ON SPACE LAW 637-38 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

217. Draft Convention on Registration of Objects launched into Space for the Exploration and Use of Outer Space, U.N. Doc. A/AC.105/C.2/SR.203 (Apr. 13, 1973), *reprinted in* 3 MANUAL ON SPACE LAW 678 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

218. *See id.*

appropriately translating this phrase into the other authentic languages of the treaty-to-be.[219] The U.S. representative offered the most extended arguments for the terminology, which was drafted into the minutes as follows:

> [T]he words 'launched into earth orbit or beyond' constituted the key phrase of the national registration provision in article II and were carried forward into article IV with regard to the transmission of information to the international register by the State of registry. Under the provisions of article IV, parties would report on the launching of objects into earth orbit or *sustained space transit*. . . . However, [the U.S. representative] pointed out that article IV did not require or anticipate the transmission of information concerning other objects that might briefly transit areas that could be considered as lying beyond airspace—such as sounding rockets, with which many negotiating countries had experimented, or ballistic missile test vehicles. As would be expected, no State had filed information concerning such activities under General Assembly resolution 1721 B (XVII).[220]

While confirming several earlier conclusions on the basic opposition of orbital to sub-orbital flights and the lack of concerns regarding sounding rockets and ballistic missiles, even the United States, however, asserted that "the primary purpose of article II was that it should encourage every State engaging in space activities to establish and maintain an orderly national record of *launchings*."[221]

D. Preliminary Conclusions Regarding the Preparatory Works

In sum, the preparatory works evidently confirm that the decision to limit the scope of the international registration requirement under the Registration Convention by way of the terminology "into Earth

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219. *See* 3 MANUAL ON SPACE LAW 680 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981) (pointing out difficulties in rendering the term "earth orbit or beyond" in all the official languages); *see also supra* Part III.A.

220. Annex II—Documents relating to Agenda Item 3 (Draft Convention on Registration of Objects Launched into Outer Space for the Exploration or Use of Outer Space), U.N. Doc. PUOS/C.2(XIII)/1/Add.4, *reprinted in* 3 MANUAL ON SPACE LAW 686 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1981).

221. *Id.*

orbit or beyond" was a conscious decision, initiated by the United States, but widely accepted in the end. While it was not entirely clear which activities were to remain outside of the Convention's scope, including those labeled sub-orbital in particular—the last-mentioned U.S. statement interestingly refers to sustained space transit, which *would* seem to apply to sub-orbital flights of the A-to-B character—there was no doubt that not all objects launched in the direction of outer space were meant to be dealt with by the Convention.

At the same time, however, the preparatory works confirm a practical focus in the sense of ignoring any possible reusability of launched vehicles, which would fundamentally alter the underlying assumption that sub-orbital flights could barely give rise to international legal ramifications in terms of responsibility and liability, for example. This was, amongst others, evidenced by the frequent references to launch aspects: registration of a space object was more or less assumed as the *de facto* equivalent to registration of the *launch* of that space object. Deep space probes were very much of a one-off character, with a short passage through areas where other space objects might be orbiting and a fundamental unlikelihood of ever returning. Sounding rocket operations, also of a one-off character but often different to the extent they were generally expected to fall back on the launching state's territory, were apparently considered not to require substantial registration requirements either.

Additionally, it should be noted that the preparatory works are supposed to serve as "*supplementary* means of interpretation" only—not as decisive ones, and certainly not if set off against ordinary meaning, context, objective and purpose, and subsequent practice.[222]

Furthermore, prudence is required in the opinion of the drafters to not simply apply the Registration Convention to all space activities in view of the many unknowns regarding future technological developments as these might turn out to be problems later on. Conversely, with respect to the text as it was finally agreed upon with a more practically defined and presumably more limited scope, it could not be excluded that later technological developments would require revisiting the issue of proper scope of application of the Convention. In that sense, we are clearly back to square one when

222. Vienna Convention, *supra* note 43, art. 32.

trying to determine applicability of the Registration Convention to private commercial manned sub-orbital spaceflight.

VII. TAKING STOCK: THE REMAINING CONUNDRUMS

A. The Proper Definition of Sub-Orbital Objects (and Flights)

So, where did the above, extended and very complicated, analysis effectively take us? What issues need to be solved before registration of private commercial manned sub-orbital space objects can be achieved by way of a largely uniform international regime—whether it would be the default regime of the Registration Convention, or another?

Sub-orbital objects and flights have been explicitly, but more often implicitly, defined in various manners. Some define sub-orbital flights as the opposite to orbital flights from an operational/technical perspective; some, by contrast, define sub-orbital in a more geographical manner. Some actually equate it more or less to reaching outer space without completing a full Earth orbit here; and some, by contrast, equate it to *not* reaching outer space as such.

Thus, if *any* harmonized application is to result, the only sensible approach remains to define sub-orbital in an operational/technical manner as non-orbital, regardless of altitudes reached—as long as, for sub-orbital *space* objects and sub-orbital *space*flight, at least the intention is to reach an area labeled outer space. Though U.S. law on this point is also not without its contradictions, this is essentially the approach that is most prominently followed and particularly important in view of the U.S. leadership in the sector. Several other relevant states around the world, moreover, seem to follow a similar approach, even if they appear to do so unconsciously.[223]

B. The Proper Interpretation of "into Earth Orbit or Beyond"

As to the Registration Convention and its Article II(1), the thorough analysis of context, object, purpose, implementation in practice and preparatory works has not been able to come up with unequivocal clarity on what its key terminology of "into Earth orbit or

223. See *supra* Part V.B, for the similar approach followed by Russia, Australia, Brazil, Belgium, and South Korea.

beyond" should refer to, with a view to addressing private commercial manned sub-orbital spacecraft and spaceflight, other than a certain area high above the earth. As research has shown, at present there is fairly little consistency in use, interpretation and implementation, and nowhere is it clarified how the term beyond refers to Earth orbit if the latter would *not* somehow refer to a place or area.

Analysis did confirm that the Registration Convention focused on orbiting spacecraft primarily for reasons of pragmatism and prudence, whereas private commercial manned sub-orbital re-usable spacecraft and spaceflight simply were on no one's horizon at the time. As the latter are fundamentally different from sounding rockets, deep space probes, and intercontinental ballistic missiles, the expressed reference at the time of drafting may need to take current and future technological developments into consideration. Reconsideration of the scope of the Registration Convention might be necessary from the present perspective to reflect the idea of private commercial spacecraft and spaceflight.

The reusability requirement, which is the key to this impending new spaceflight sector, may cause a particular vehicle to be launched dozens or even hundreds of times—and it is here that the underlying function of registration of craft (as opposed to registration of individual events, read launches), in terms of identification for the purposes of state responsibility and liability, becomes so much more relevant.

That underlying function should override any concerns that have been voiced so far with registering craft as these would presumably be in outer space for a total of just a handful of minutes, which would only apply to a one-off commercial sub-orbital hop. Firstly, in the aggregate such space objects will clock much more time in space, and it has to be noted again that it is the space *object*, not the space *flight*, that requires registration. Secondly, once the paradigmatic shift from A-to-A to A-to-B sub-orbital flight is realized, still longer in-space times *will* be clocked and other countries other than the launching state *will* become involved.

The phrasing of "Earth orbit or beyond" as different from, most particularly, outer space was chosen on purpose and after a considerable debate. Yet, it should be viewed from such a perspective of pragmatism and should also be interpreted as similar to the term

outer space, as both have been alternatively used almost at random in a number of instances in the space treaties.

All of this, finally, does not provide insurmountable obstacles to—if it does not indeed outright underpin!—simply applying the ordinary meaning of beyond as an essentially geographical determinant of location. "In(to) Earth orbit or beyond" should, thus, be read as principally referring to an area somehow defined by the reference to Earth orbit. This would still represent the most feasible approach to a uniform and consistent interpretation of the Registration Convention in this context.

C. Conclusion: the Proper Scope of the Registration Convention

In conclusion, the Registration Convention should principally be deemed to apply (or at least potentially apply) to all space objects launched into an area described as "Earth orbit or beyond." Since it has also been clarified that sub-orbital flights should be only defined with reference to orbital flights as presenting their exact operational opposite, it becomes clear that any space object that actually enters that area described as "Earth orbit or beyond" should be deemed, in principle, subject to the requirements of international registration as per the Registration Convention even if its flight does not complete an orbit around the earth.

Then, this leaves us with two final issues to be addressed by the current analysis. First, can we arrive at a closer determination where the boundary between sub-orbital objects reaching "Earth orbit or beyond" and sub-orbital objects not reaching that area lies? In other words, which category of sub-orbital craft would be subject to the Registration Convention and which category would not be? Next, noting that the Convention has not been applied to sounding rockets, deep space probes, launches gone wrong, and intercontinental ballistic missiles, would there be any reason *not* to apply it to the vehicles to be used for private commercial manned sub-orbital spaceflight, provided that these aim for that area of "Earth orbit or beyond"?

VIII. REVISITING AN OLD ACQUAINTANCE: THE ISSUE OF DELIMITATION OF OUTER SPACE

A. Relating "into Earth Orbit or Beyond" to "in Outer Space"

The first question harks back to a discussion of the delimitation of outer space by way of some geographical criterion or other, which has been raised since the beginnings of mankind's ventures into outer space. It has already been suggested above at various points that "into Earth orbit or beyond" is, at least, very close in meaning to "in outer space" and essentially that is the question that should be reviewed in a more structured manner.

The need to unequivocally establish a boundary between air space and outer space has been denied by some key space-faring states, notably the United States, as it is deemed largely theoretical if not even dangerous for proper development of legal regulation of space activities.[224] However, with the impending kick-off of proper private commercial sub-orbital flights carrying humans on board for commercial purposes, this conundrum should not be allowed to linger. Operators and governments—those licensing the flights as well as others potentially impacted thereby—need to know to what extent the Registration Convention applies to them *de jure*, what the results are in terms of jurisdiction, who is responsible and/or liable, and if applicable, how such results would have to be addressed specifically in the context of vehicles to be used for dozens, if not hundreds, of individual flights.

These questions can be answered in the abstract by both space law and air law (not to mention other potentially applicable systems of law such as high-adventure tourism law), but such answers would diverge considerably.[225] Also, an infant sector with great potential for revolutionizing human access to outer space should be offered maximum legal certainty regarding the precise set of rules applicable to their activities.

When addressing the resistance to agreeing on a clear-cut boundary between airspace and outer space, it is important to consider

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224. *See, e.g.*, CHATZIPANAGIOTIS, *supra* note 14, at 14-17; Frans G. von der Dunk, *The Sky is the Limit—But Where Does It End?*, *in* 48 PROCEEDINGS OF THE FORTY-EIGHTH COLLOQUIUM ON THE LAW OF OUTER SPACE 84, 85 (2006).

225. *Cf., e.g.*, von der Dunk, *supra* note 9.

the quite principled "spatialist" character of fundamental space law concepts, such as the Outer Space Treaty's state responsibility under Article VI[226] and Article II of the Treaty's character of outer space as a "global commons."[227] These space law concepts fundamentally disallow states from exercising territorial jurisdiction in outer space and allow states to exercise quasi-territorial jurisdiction *only* for space objects and their personnel, if the space object was registered as previously discussed.[228]

These space law concepts are fundamentally opposed to the absolute sovereignty underlying a state's exercise over their national airspace.[229] A state's absolute sovereignty translates *inter alia* into the right to refuse entry to any foreign craft into its airspace or condition such entry as it sees fit, and the right to exercise criminal jurisdiction on board any craft in its airspace, unless the 1963 Tokyo Convention provides otherwise, and the state is a party to the Tokyo Convention.[230]

Secondly, in the international context, states generally look for clear, geographically defined boundaries to determine where their respective sovereign territorial jurisdiction ends. Take, for example, the extended process in maritime law to determine in precise terms the extent of territorial seas, continuous zones, exclusive economic zones, and continental shelves.[231] South Africa and Australia's efforts to delineate the vertical extension of their sovereignty by way of

226. Notably, Article VI of the Outer Space Treaty refers to international responsibility for certain categories of "activities in outer space," i.e., applying a spatialist, geographic criterion to delineate its scope. *See* Outer Space Treaty, *supra* note 12, art. VI.

227. *See id.* art. II

228. *See* Registration Convention, *supra* note 32, art. II(2); Outer Space Treaty, *supra* note 12, art. II.

229. *Cf.* Chicago Convention, *supra* note 10, art. 1.

230. *See* Convention on Offences and Certain Other Acts Committed on Board Aircraft art. 4, Sept. 14, 1963, 704 U.N.T.S. 219 (providing that the state, in whose airspace an aircraft registered with another state is flying, is the primary state entitled to exercise its "criminal jurisdiction over an offence committed on board" even though the former state should not do so unless other criteria apply); *see also* CHATZIPANAGIOTIS, *supra* note 14, at 43-44; Abeyratne, *supra* note 8, at 1903.

231. *Cf., e.g.*, United Nations Convention on the Law of the Sea arts. 3, 33(2), 56-57, 76, Dec. 10, 1982, 1833 U.N.T.S. 3; Wallace, *supra* note 44, at 134-72.

domestic space law also serve as examples of this tendency to define clear geographical boundaries for space activities.

The irony here is that the United States, perhaps the most vocal supporter of the "functionalist theory", which determines the application of air and space law respectively on the basis of whether something functionally qualifies as an aviation-type of activity or space activity regardless of where that activity takes place, and hence, refuses to agree on a clearly defined lower boundary of outer space, is the very same country where sub-orbital flight now is so imminent that revisiting and solving the old conundrum is required. Yet, in maritime law, even the United States did not oppose the introduction of a number of horizontal boundaries defined in quite precise numerical terms,[232] even though, contrary to outer space where the physical characteristics of the environment do change with altitude, there is no fundamental physical difference between the water in a territorial sea and the water hundreds of miles offshore.

Finally, "into Earth orbit or beyond" used in Article II(1) of the Registration Convention, as discussed *in extenso* above, is really just one more example of this discussion: whether the Convention applies is ultimately determined by this geographic concept. However, as previously indicated, this would then leave the orbit issue to be solved, as orbit or Earth orbit are by no means singularly precise criteria from a geographical standpoint. So what, then, does "Earth orbit" refer to, in view of the multitude of orbits used for satellite operations so far?[233]

Earth orbit can only logically refer to this: to simply take the lowest possible orbit as a reference point. As such, Earth orbit should refer to the *lowest* Earth orbit, and beyond Earth orbit to anything beyond the *lowest* Earth orbit. And indeed, this refers back to the issue of how to define and delimit outer space, which has been focused on its lower boundary that sets it apart from Earth's airspace and its boundary, which could best be determined with reference to the lowest Earth orbit, or what has become known as "the lowest perigee rule."[234]

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232. *See, e.g.*, 1958 Geneva Conventions on the Law of Sea, Apr. 29, 1958, 450 U.N.T.S. 11.

233. *See supra* Parts III.A&B.

234. *See further infra* Part VIII.B.

Is it possible to close the remaining conceptual gap between lowest Earth orbit and outer space, and see whether the two are really that different? As argued, it would make most sense to interpret "in Earth orbit or beyond" with reference to the lowest Earth orbit; agreeing that lowest perigee and the lower boundary of outer space would indeed be interchangeable would be the ultimate step.[235]

Making these terms interchangeable would beg two further questions: (1) is this the lowest Earth orbit so far *realized* or the lowest Earth orbit so far considered *feasible*, and (2) is it already possible, and even proper, to place a distinct figure on whichever option is chosen?

B. Defining "Earth Orbit or Beyond" as a "Precise" Geographic Concept

When addressing what "into Earth orbit and beyond" and outer space mean, it is important to note that (on the lowest orbit achieved that is respectively feasible) many different figures have been quoted. The ongoing hesitation among key space-faring states to agree on *any* figure as a boundary,[236] and the consequent absence of any international authority on the issues of lowest actual orbit or lowest feasible orbit, would require experts to provide guidance.

Most famously, Theodore von Kármán came up with calculations showing that at about an altitude of 100 kilometers "the Earth's atmosphere becomes too thin for aeronautical purposes (because any vehicle at this altitude would have to travel faster than orbital velocity in order to derive sufficient aerodynamic lift from the atmosphere to support itself)."[237] However, other experts have differed from Kármán. For example, Bin Cheng referred to approximately 80

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235. *See, e.g.*, *supra* Part IV.A.

236. *See generally* CHATZIPANAGIOTIS, *supra* note 14, at 6-17; CARL Q. CHRISTOL, THE MODERN INTERNATIONAL LAW OF OUTER SPACE 502-11 (1982); FRANCIS LYALL & PAUL B. LARSEN, SPACE LAW: A TREATISE 153-73 (2009); Gerhard, *supra* note 7, at 280-82; Thomas Neger & Edith Walter, *Space law— An Independent Branch of the Legal System*, *in* OUTER SPACE IN SOCIETY, POLITICS AND LAW 234, 239-41 (Christian Brünner & Alexander Soucek eds., 2011); Freeland, *supra* note 1, at 6-10; Hobe, *supra* note 1, at 441-42; Vladimir Kopal, *The Question of Defining Outer Space*, 8 J. SPACE L. 154 (1980).

237. LUDWIG WEBER & ELMAR MARIA GIEMULLA, INTERNATIONAL AND EU AVIATION LAW: SELECTED ISSUES 49 (2011).

kilometers as the lowest orbit possible, while also pointing at one satellite that actually achieved a perigee as low as 96 kilometers.[238] Likewise, Everrett Dolman refers to some 83 kilometers.[239] Also Francis Lyall and Paul Larsen refer to a similar altitude, although rather tentatively, quoting some 90 kilometers.[240] Jerry Sellers, by contrast, aims considerably higher and refers to some 130 kilometers;[241] whereas the U.S. Air Force Manual even refers to some 150 kilometers.[242]

In sum, according to expert analysis, the boundary between airspace and outer space could only be said to lie somewhere in the range of 80 to 150 kilometers above the surface of the earth if it would have to equate with the lowest perigee.

As it went, those in favor of any boundary focused on the 100 kilometers zone in their arguments for two reasons—because it reflected Von Kármán's original calculations and because it made for a nice round figure. While some refer to different altitudes, surveying the growing practice of states and others shows that opinions indeed increasingly converge on a 100 kilometers altitude above the earth's surface.

How nation-states define the lowest possible orbit is directly relevant to the potential development of customary international law on the delimitation issue.[243] Since the 1970s, the Soviet Union repeatedly proposed to set the lowest possible orbit's legal boundary at an altitude of 100 kilometers (sometimes providing 110 kilometers as an alternative).[244] Then in 1995, based on a Russian initiative, the U.N. Committee on Peaceful Uses of Outer Space (COPUOS)

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238. *See* BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 448, 450 (1997).

239. *See* EVERETT C. DOLMAN, ASTROPOLITIK: CLASSICAL GEOPOLITICS IN THE SPACE AGE 115 (2002).

240. *See* LYALL & LARSEN, *supra* note 236, at 168.

241. *See* JERRY J. SELLERS ET AL., UNDERSTANDING SPACE: AN INTRODUCTION TO ASTRONAUTICS 73 (3rd ed. 2004).

242. *See* Edward P. Chatters, Bryan Eberhardt & Michael S. Warner, *Orbital Mechanics*, *in* AU-18 SPACE PRIMER 89, 97 (2009), *available at* http://space.au.af.mil/au-18-2009/au-18-2009.pdf.

243. *Cf., e.g.*, CASSESE, *supra* note 44, at 119-26; WALLACE, *supra* note 44, at 9-19.

244. *Cf., e.g.*, Kopal, *supra* note 236, at 148.

addressed a questionnaire to its member states on the issue of "aerospace objects."[245] Although only a few states responded to the questionnaire, three of them addressed the outer space delimitation issue, even if in an indirect manner.

Pakistan referred to "altitudes lower than between 90 and 100 km," where a spacecraft was "bound to decay within the next orbit."[246] Therefore, in the language of the COPUOS Secretariat's summary, such a spacecraft would become to "subject to rules of air law."[247]

Germany adorned an extended analysis of re-entry trajectories of the U.S. space shuttle, with an interesting graphical depiction. It showed the area between 60 and 100 kilometers altitude as a shaded zone (the lower altitude being a mere 14-15 minutes before touchdown), placing the entry below a 100 kilometers altitude at about 30 minutes prior to touchdown; and, in the accompanying text, it equated this with "re-entry into the Earth's atmosphere."[248] Significantly, a relatively large number of states referred to "the atmosphere" as the area where air law would rule, at the same time confirming the atmosphere is *not* part of outer space.[249]

Finally, Russia itself, somewhat prematurely perhaps, "observed that international practice . . . was evolving, whereby State sovereignty did not extend to space located above the orbit of least perigee of an artificial Earth satellite (approximately 100 kilometers above sea level). In cases where flights have occurred below this level, States have furnished, on the basis of goodwill, relevant

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245. *See* Comm. on the Peaceful Uses of Outer Space, Legal Subcomm, Rep. on its 34th Sess., 1995, U.N. Doc. A/AC.105/C.2/1995/CRP.3 (1995) ("Questionnaire on possible legal issues with regard to aerospace objects.").

246. *See* Comm. on the Peaceful Uses of Outer Space, Legal Subcomm, Rep. on its 38th Sess., § 6, U.N. Doc. A/AC.105/635 (Feb. 15, 1996) [hereinafter Replies from Member States].

247. *See* Comm. on the Peaceful Uses of Outer Space, Legal Subcomm, Rep. on its 38th Sess., § 18, U.N. Doc. A/AC.105/C.2/L.204 (Feb. 18, 1997) [hereinafter Comprehensive Analysis of Replies].

248. Replies from Member States, *supra* note 246, at 4-5.

249. *See, e.g.*, *The Outer Space Environment*, NASA QUEST, http://quest.nasa.gov/space/teachers/suited/3outer.html (last visited Apr. 7, 2013) ("Outer space . . . is the void that lies *beyond the uppermost reaches of the atmosphere* of Earth and between all other objects in the universe.").

information to States whose territory was overflown."[250] Thus, Russia claimed relevant "provisions of international customary law in this field were evolving."[251]

A look at the laws of different nations also provides clues to the altitude(s) at which outer space begins—even including, again, the United States. The National Aeronautics and Space Act of 1958 was the first domestic law dedicated to space activities and established the National Aeronautics and Space Administration (NASA); this Act also defines "space" referring to "space activities" within the area "outside the earth's atmosphere."[252] Again, "the atmosphere" was considered by many states to be synonymous to airspace. Thus, even if the Act does not refer to a specific altitude, it almost *ipso facto* considers it impossible to orbit a satellite around the earth within the atmosphere—in other words, below the lowest possible orbit. Furthermore, the Federal Aviation Administration (FAA), a U.S. government administration, has accorded astronaut's wings to anyone flying above 62.5 miles or 100 km—though, from a customary law-perspective, the evidentiary value is weakened by alternative altitudes other U.S. government bodies reference in their regulations.[253]

South Africa was the first state to define "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."[254] Thus, it made—as the first state to do so—the explicit linkage between "outer space" and the "lowest perigee." Then, Australia amended its 1998 Space Act in 2002, redefining "launch," "return,"

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250. Comprehensive Analysis of Replies, *supra* note 247, § 63; Replies from Member States, *supra* note 246, at 6.

251. Comprehensive Analysis of Replies, *supra* note 247, § 63.

252. National Aeronautics and Space Act of 1958, Pub. L. No. 85-568, § 103(1)(A), 72 Stat. 426 (codified at 51 U.S.C. § 20103 (2006)), *reprinted in* 1 SPACE LAW: BASIC LEGAL DOCUMENTS E.III.1 (Karl-Heinz Bockstiegel, Marietta Benko & Stephan Hobe eds., 2005).

253. See Roger D. Launius & Dennis R. Jenkins, *Is it Finally Time for Space Tourism?*, 4 ASTROPOLITICS: INT'L J. SPACE POL. & POL'Y 279 n.63 (2006), for the issues concerning the FAA. The U.S. Navy and NASA, however, have routinely handed astronaut wings to those having achieved altitudes of 50 miles and over, which is akin to 80 kilometers. *See id.*; *see also* E-mails from R. M. Bresnik, Attorney-Adviser, NASA's Legal Office (Mar. 19, 2007, and Mar. 22, 2007) (on file with the author).

254. Space Affairs Act 84 of 1993 § 1(xiv) (S. Afr.).

and "space object" by replacing the reference to "outer space" with the phrase "an area beyond the distance of 100 kilometers above mean sea level."[255] Apparently, the Isle of Man's treasury regulations also have used the same "demarcation point" to define "space object."[256]

Finally, in the context of export controls for dual-use technology, the European Union (EU) referred to the same altitude when discussing "space-qualified," which "refers to products designed, manufactured and tested to meet the special electrical, mechanical or environmental requirements for use in the launch and deployment of satellites or high altitude flight systems operating at altitudes of 100 kilometers or higher."[257] The EU currently consists of twenty-seven member states, including such leading spacefaring nations as France, Germany, the United Kingdom, Italy, and Spain; arguably, this EU document could constitute a first, indirect measure of *opinio juris* on behalf of the EU member states that consider 100 kilometers altitude as the legal boundary between airspace and outer space.

Also, outside of international public law some interesting clues into where the legal boundary should lie were provided. First, the private companies that are about to provide manned commercial flight opportunities use the 100 kilometers figure as the key altitude in their advertisements.[258] Standing alone, private entities' behavior is not evidence of, and does not give rise to, customary international law. Yet, it is important to note that these operators only use the term "sub-orbital" in an operational/technical sense, referring to "not reaching an orbit," even though they claim that their flights are reaching outer space.[259]

Beyond that, 100 kilometers is also the boundary between air space and outer space as far as the *Fédération Aéronautique*

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255. *Space Activities Act 1998* (Cth) s 8 (Austl.).

256. *See* Steven Freeland, *The Impact of Space Tourism on the International Law*, *in* PROCEEDINGS OF THE FORTY-EIGHTH COLLOQUIUM ON THE LAW OF OUTER SPACE 178, 187 n.18 (2006).

257. Council Regulation 428/2009, Setting up a Community Regime for the Control of Exports, Transfer, Brokering and Transit of Dual-Use Items, Annex I, 2009 O.J. (L 134) 1, 28 (EC).

258. *See, e.g.*, *About Lynx*, XCOR AEROSPACE, http://www.xcor.com/products/vehicles/lynx_suborbital.html (last visited Apr. 1, 2013) ("This . . . space transport will take humans and payloads . . . to 100 km (330,000 feet) . . . .")

259. *See, e.g.*, *id.*

Internationale (FAI), the global world aviation sporting events organization, is concerned.[260] And. at least one U.S. state, Virginia, previously contemplated the including the same altitude in its state-level legislation.[261] If Virginia contemplated including this in its legislation, however, the effect would be offset by another U.S. state, New Mexico, which maintains 60,000 feet (only 18 kilometers) as an upper limit of its jurisdiction in tax matters.[262] Finally, a recent study of the International Academy of Astronautics (IAA), one of the most authoritative bodies of individual experts on matters of outer space, referenced 100 kilometers as the point of re-entry into a national airspace.[263]

C. Convergence on 100 Kilometers as the Lower Boundary for Applying the Registration Convention

It is clear that states tend to look for precise boundaries to where they can exercise their sovereign jurisdiction and will assume that other states will fully respect their jurisdiction. Increasingly, states consider 100 kilometers as the altitude to which sovereign jurisdiction extends. Is it too farfetched then to assume that 100 kilometers should be the altitude—at least tentatively—that defines "Earth orbit" in the Registration Convention? In other words, the Registration Convention would apply to any space object intended to be launched to an altitude of 100 kilometers or beyond?

This would merely require a re-interpretation rather than a formal amendment of the Registration Convention. It would provide a clear-cut guideline for any state confronted with the need to determine when to assume sovereign, territorially-based jurisdiction. Further, a clear-

260. *See* Launius & Jenkins, *supra* note 253, at 279 n.63.

261. *See* H.B. 3184, 2007 Gen. Assemb. § 8.01-227.8 (Va. 2007) (defining "spaceflight activities" in reference to suborbital flights). And, under an inverted geographic approach, "suborbital" means "a distance at or above 62.5 miles from the Earth's mean sea level." *Id.*

262. *See* N.M. Stat. Ann. § 7-9-54.2(E)(3) (West 2007) (defining space as "any location beyond altitudes of sixty thousand feet above the earth's mean sea level"); *see also* E-mail from L. Montgomery, Senior Attorney, Office of the Chief Counsel of the Fed. Aviation Ass'n (Mar. 6, 2007) (on file with the author).

263. *See* INT'L ACAD. OF ASTRONAUTICS, COSMIC STUDY ON SPACE TRAFFIC MANAGEMENT 39 (Corinne Contant-Jorgenson, Petr Lala & Kai-Uwe Schrogl eds., 2006).

cut line coincides with how both a growing number states and private companies define where outer space begins, such as commercial sub-orbital spaceflight operators themselves.

IX. APPLYING THE REGISTRATION CONVENTION TO MANNED SUB-ORBITAL SPACEFLIGHT

A. The Difference Between Private Manned Commercial and Other Sub-Orbital Spaceflight

As discussed above, the Registration Convention should, in principle, apply to any space object launched (or intended to be launched) into "outer space," at an altitude of 100 kilometers or higher. Then the final question remaining is whether, and if so how, the Convention should be applied at an international or national level. The Registration Convention under the assumptions currently prevailing excludes sounding rockets, deep space probes, space objects launched but broken up before getting close to outer space, and intercontinental ballistic missiles from its scope; but as argued, nothing inherently stands in the way of altering that assumption.

Above it has been argued that the intended repetitive character of the flights with private commercial sub-orbital manned spacecraft, the intended safe re-entry thereof, and the envisaged extension of the sub-orbital flight envelope from simple up-and-down A-to-A trajectories to proper "space-transiting" A-to-B trajectories would make the application of the Registration Convention more relevant in this case, compared to the four exceptions.

In addition to these arguments, a look at the prospective operating places for private commercial manned sub-orbital spaceflight clarifies that the likelihood of international ramifications, particularly in terms of state responsibility and liability, is far from negligible anymore—even for mere A-to-A flights. The 2004 flights from the Mohave Desert were perhaps unlikely to cross over into the airspace or outer space of other states than the United States. Flights from other spaceports, however, may much more easily cross into foreign airspace or outer space above other states. For example, Kiruna would be considerably closer to a border (in this case with Norway and Finland).[264] Additionally, Curacao, Singapore, and the United

264. *See* von der Dunk, *supra* note 1, 420-21 n.86.

Arab Emirates are smaller territories, which could also readily cause flight paths to cross into or above neighboring countries.

In short, the impending arrival of manned commercial spaceflight would require an international legal regime to regulate the dozens, or even hundreds, of flights of a single vehicle. In particular, this should be achieved as argued in terms of registration in accordance with the Registration Convention, if we do not wish to find ourselves with a wide array of regional, national, or local regulations dealing with the spaceflight issue.

B. Towards a Proper "Space Traffic Management" System Under the Registration Convention

The major obstacle to applying the Registration Convention to private manned commercial sub-orbital spaceflight is the unfortunate unconscious equation of a space object with its single launch, which directly gives rise to certain key information requirements. How would the Regulation Convention, proceeding on the single launch assumption, handle information on repeated or even frequent launches? Moreover, how would the widespread practice of providing information *after* a launch, sometimes considerably later, impact the need for timely information on a range of launches?

The single launch presumption of the Registration Convention has also determined how the international register works in practice—with further notifications providing for updates. Yet, while the Convention itself refers to the requirement to provide information on "[d]ate and territory or location of launch," this clause could easily accommodate multiple launches because without the definitive article "the" before "launch," in contrast to "*the* space object," the reporting requirement is not necessarily restricted to one launch.[265]

Thus, on a closer view, the Registration Convention itself does not need to present too much of an obstacle here either. Unfortunately, the clause of Article IV(1) of the Registration Convention that relevant information on a space object should be furnished to the United Nations "as soon as practicable" has given rise to quite a lot of unfortunate state practices of non-registration.[266] This, however,

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265. Registration Convention, *supra* note 32, art. IV(1)(c) resp. (b) & (e) (emphasis added).

266. *See, e.g.*, Yoon Lee, *Registration of Space Objects: ESA Member States'*

should not be used, as an argument for continuing not to register space objects—that is, they would be sub-orbital, make just a single flight, and enjoy a fairly minimal risk of interference with other states' space activities (especially with a view to state responsibility and liability).

When private manned commercial spaceflight takes off, a major amount of planning of individual flights is necessary, and it should be considered "practical" to provide at least some details of planned future flights for inclusion in the international register in advance. Also, substituting orbital parameters with parameters for determining sub-orbital trajectories could certainly, at least initially, be undertaken without formal amendment to the Registration Convention or adoption of a specific new protocol thereto.

Modern electronic and web-based means of storage of, and access to information, which have not been available since the time of drafting the Regulation Convention, now allow for a continuous update of launch information if planned flights were cancelled or rescheduled. Again, it should be remembered that it is every individual *space object* that should be registered, not every individual *launch* or *flight*, even as individual space objects now could make dozens or hundreds of such flights.

This information system would require a provision to be developed under the Registration Convention for an embryonic space traffic management system for such flights. Though, of course, never envisaged to work this way by the drafters, nothing within the Convention would specifically prevent a space traffic management system's implementation from being extended this way. The added advantage of such an embryonic space traffic management system would be that by the time the world can no longer afford to do without one, sufficient experience will be developed to handle the much more complex future point-A-to-point-B spaceflights (where the arguments that only a single state, its airspace and a tiny fraction of outer space directly above it are concerned would no longer apply) in a generically safe manner as well.

Practice, 22 SPACE POL'Y 42, 43-44 (2006).

C. The U.S. Example of Handling Private Commercial Sub-Orbital Spaceflights

The U.S. example, where both commercial launches and manned commercial spaceflight have been addressed in far greater detail than anywhere else, is illustrative here. After all, the FAA, in addressing the incumbent manned commercial spaceflight sector, uses a version of the Commercial Space Launch Act, originally from 1984 and equally geared to handle expendable space object launches (that is, with one launch per space object), but now adapted by the 2004 Commercial Space Launch Amendments Act to handle multiple launches of the same manned vehicle by way of licenses.

Specifically, the FAA offered two types of licenses under the Commercial Space Launch Act for unmanned commercial launches with expendable vehicles. On the one hand, already the "launch-specific license," in spite of its label, "authorizes a licensee to conduct one or more launches, having the same launch parameters, of one type of launch vehicle from one launch site."[267] On the other hand, even more generally, the "launch operator license" "authorizes a licensee to conduct launches from one launch site, within a range of launch parameters, of launch vehicles from the same family of vehicles transporting specified classes of payloads. A launch operator license remains in effect for five years from the date of issuance."[268]

Tackling the arrival of reusable launch vehicles (RLVs), particularly relevant for private manned commercial space sub-orbital flights, the FAA now offers two types of RLV licenses along similar lines. The "mission license":

> authorizes a licensee to launch and reenter, or otherwise land, one model or type of RLV from a launch site approved for the mission to a reentry site or other location approved for the mission. A mission-specific license authorizing an RLV mission may authorize *more than one RLV mission* and identifies each flight of an RLV authorized under the license. A licensee's authorization to conduct RLV missions

267. 14 C.F.R. § 415.3(a) (2012) ("A licensee's authorization to launch terminates upon completion of all launches authorized by the license or the expiration date stated in the license, whichever occurs first.").

268. *Id.* § 451.3(b).

> terminates upon completion of all activities authorized by the license or the expiration date stated in the reentry license, whichever occurs first.[269]

Alternatively, an "operator license":

> authorizes a licensee to launch and reenter, or otherwise land, any of a designated family of RLVs within authorized parameters, including launch sites and trajectories, transporting specified classes of payloads to any reentry site or other location designated in the license. An operator license for RLV missions is valid *for a two-year renewable term*.[270]

As a matter of fact, the only permit so far handed out by the FAA for commercial manned spaceflight, as mentioned, was granted for a *series* of launches.[271]

In short, if it is possible in the substantive, elaborate, and consequential context of licensing private commercial manned spaceflights—whether sub-orbital or not, as long as intended to reach outer space—as per the U.S. Commercial Space Launch Act to handle the frequent re-use of spacecraft, the latter should not be viewed as an obstacle to finally acknowledge that the Registration Convention should, and by a mere logical re-interpretation of key terminology easily would, encompass the types of flights that the world will soon see with some frequency, into the lower edges of outer space as commonly defined—manned commercial sub-orbital spaceflights operated by private companies for (largely) private customers.

X. CONCLUDING REMARKS

All in all, the Registration Convention, following a thorough and complex investigation and analysis of the key terminology of "into Earth orbit or beyond"—its context, object, purposes, implementation, and preparatory works—contrary to popular belief, is shown *not* to exclude by definition all space objects and flights to be labeled sub-

269. *Id.* § 431.3(a) (emphasis added).
270. *Id.* § 431(3)(b) (emphasis added).
271. *See supra* Part V.A.

orbital. As sub-orbital is concluded to effectively equate with non-orbital regardless of the altitude—provided a minimum altitude indicated by the concept Earth orbit is achieved—only those sub-orbital objects *not* achieving such altitude (or more precisely, not *intended* to achieve such altitude) would be excluded from the scope of its provisions; thus, no *space* objects would be at issue anymore.

Hitherto, four categories of sub-orbital space objects *have*, one way or another, in practice or law, been excluded—sounding rockets, deep space probes, launched objects fragmented before getting to outer space, and intercontinental ballistic missiles—from the Registration Convention for a variety of practical and principled reasons. These reasons, however, would not hold true for private manned commercial sub-orbital spaceflight. Only for flights that will play out in a single state's airspace, with no risk whatsoever to other states being inadvertently involved, in terms of state responsibility for national activities in outer space and state liability for damage caused by space objects launched as a launching State, could a practice be envisaged where no international registration would probably be required, at least for the time being.

The Registration Convention is to be viewed as providing the appropriate foundation for an, at first perhaps embryonic, international space traffic management system handling all objects reaching outer space; the equation of its key terminology "into Earth orbit or beyond" with the more generic term outer space, and the convergence in this context on a 100 kilometers altitude as providing the (provisional) lower boundary of outer space, as derived from a rough estimate of the lowest feasible orbit, allows for an easy and coherent elaboration of the first vestiges of such a system. Such elaboration, following, for example, the United States' approach to licensing private manned commercial sub-orbital spaceflight, could also relatively easily overcome the unspoken equation of a space object with its launch for registration purposes, as the craft developed for private manned commercial sub-orbital spaceflight will be intended for multiple and frequent reuse.

In particular, once the next paradigmatic step is taken—moving from A-to-A sub-orbital tourist excursions to A-to-B space-transiting traffic (which may certainly also come to include traffic to and from the space station, as NASA is currently developing in cooperation with the private sector)—such an international space traffic

management system would no longer be a luxury but a prerequisite for achieving a proper balance in the general public interest in safe, secure, environmentally-benign, and economically-beneficial use of outer space as a "global commons," and the interests of *bona fide* private enterprise in fair, transparent, and legally-protected opportunities to do business.