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National Regulation of Private Suborbital Flights: A Fresh View

Rafael Moro-Aguilar[*]

ABSTRACT

An analysis of international law applicable to air and space activities reveals a lack of regulation specifically addressed to suborbital flight. In the absence of any international rules, States interested in having private manned suborbital flights for "space tourism" and other purposes depart from their territories will regulate this activity within the framework of their national air or space law. The United States has been a pioneer in enacting legislation covering this activity. It did so by means of the 2004 Commercial Space Launch Amendments Act (CSLAA), which modified U.S. domestic space law. The CSLAA introduced a *sui generis* legal regime for all private spaceflight, which for the moment excludes certification of the vehicles and relies instead on the licensing of launches and on the "informed consent" of the participants.

A different approach was proposed in 2008 by a number of European Union (EU) officials, whereby private suborbital flights would rather be considered as (mostly) a kind of aviation, and thus would fall under the control of EU law. However, recent events seem to indicate a willingness by certain EU Member States to regulate this activity by themselves, at least during the initial phases of operations.

After providing a general background to the existing U.S. suborbital flight regulation, and a description of the 2008 EU regulatory proposal, the present paper will introduce the latest developments identified in the national regulation of human spaceflight, in particular the United Kingdom's government review of commercial spaceplane certification and operations (July 2014), and Spain's draft bill on Outer Space Activities (2014), which includes the domestic regulation of private human suborbital flight.

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I. INTRODUCTION

1.1. Definition of Suborbital Flight

As of 2015, a number of private companies had announced their plans to start operating reusable suborbital vehicles intended to carry paying passengers to the threshold of outer space.[1] Most of these ventures will take place in the United States. However, some have also expressed their intentions to fly from Europe and elsewhere.[2]

Suborbital flight is by no means a technical novelty, and this kind of trajectory has been used for many decades. Examples of already existing suborbital devices are:

> Sounding rockets, or small rockets used by scientists to conduct experiments in microgravity and make astronomical observations above the atmosphere;
> Ballistic missiles (particularly Inter-Continental Ballistic Missiles, ICBMs), used by the military to convey warheads onto the battlefield; and
> Certain objects designed for in-flight experimentation of space technologies, such as systems for atmospheric reentry. One example is the *Intermediate eXperimental Vehicle* (*IXV*), which was successfully launched by the European Space Agency from Kourou, French Guiana, on a *Vega* rocket in February 2015.[3]

All these devices are unmanned, have usually not crossed any international frontiers, and have posed no significant legal problem so far.

Manned suborbital flight has also happened before. The first two flights

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1 The term "suborbital" has been defined as "relating to or denoting a trajectory that does not complete a full orbit of the earth." *Suborbital Definition*, OXFORD ENGLISH DICTIONARY (OED) (2013), *available at* http://www.oxforddictionaries.com/definition/english/suborbital?q=suborbital#. For further explanation about suborbital flight, see ORBSPACE, http://www.orbspace.com/es/Background-Information/Sub-orbital-vs-Orbital.html (these and all other websites mentioned in this paper were last accessed and verified Jan. 15, 2015).

2 Suborbital projects under current development in the U.S. are Virgin Galactic's *SpaceShipTwo* (*SS2*); XCOR Aerospace's *Lynx*; Blue Origin's *New Shepard*; and Masten's *Xaero*. All of them are performing tests, with Virgin Galactic and XCOR being the two most advanced ventures. The main projects announced in Europe are the suborbital vehicles of the companies EADS-Astrium, Dassault, Booster, REL-Skylon, Bristol Spaceplanes, and Swiss Space Systems (S3). None of the latter has moved beyond the design stage, except for S3's *SOAR* suborbital spaceplane. In addition, Virgin Galactic has expressed the possibility of operating *SS2* from Sweden and from Scotland; XCOR Aerospace had plans to fly the *Lynx* from Curaçao (in the Caribbean) and from Daejeon (South Korea); and S3 has announced its intention to launch from Colorado (USA), the Canary Islands (Spain), and Spaceport Malaysia. *See* VIRGIN GALACTIC, http://www.virgingalactic.com; XCOR AEROSPACE, http://xcor.com/lynx/; BLUE ORIGIN, http://www.blueorigin.com/; MASTEN SPACE SYSTEMS, http://masten-space.com/; S3, SWISS SPACE SYSTEMS, http://www.s-3.ch/en/home.

3 *See* EUR. SPACE AGENCY, http://www.esa.int/Our_Activities/Launchers/IXV.

of the *Mercury* American manned space program, by A. Shepard and V. Grissom in 1961, were suborbital flights. The numerous test flights conducted by the *X-15* rocket planes in the 1960s also followed basically suborbital trajectories. What is new is the activity of transporting passengers to extremely high altitudes following suborbital trajectories on a regular basis and with commercial purposes.

Since this activity is primarily a private undertaking, which is not sponsored by governments, a business case is necessary in order to justify the private investment and sustain an emerging suborbital industry. According to several studies, a market exists for private human spaceflight for leisure purposes, or "space tourism." The most recent of these surveys was jointly conducted by the Tauri Group and the Federal Aviation Administration and presented to the U.S. Congress in July 2012.[4]

Although less known to the public, another very promising application of manned suborbital flight is human-tended microgravity experiments and scientific research in general.[5] Other potential commercial uses for manned suborbital vehicles are: astronaut and pilot training; reconnaissance and remote sensing; and in the longer term, ultra-fast point-to-point transportation of passengers and cargo.

At the time of writing, the development of reusable suborbital vehicles is still ongoing. Progress is slowly, but steadily, being achieved by several companies like Virgin Galactic (VG) and XCOR Aerospace.[6] However, the tragic accident suffered by VG's prototype *SS2* in October 2014[7] constitutes a serious setback that threatens to delay further progress for a number of years.

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[4] The Tauri Group found that commercial human suborbital flight could become a $1.6 billion industry in the next decade, with a worldwide demand of 400 to 500 seats per year, at an average price of $200,000 per seat. Demand at these prices was found to be genuine, sustained, and sufficient to support multiple operators. The Tauri Group, *Suborbital Reusable Vehicles: A 10-Year Market Demand Forecast* (2012). A summary is available at http://www.faa.gov/about/office_org/headquarters_offices/ast/media/Suborbital_Reusable_Vehicles_Report_2pager.pdf.

[5] According to the market survey carried out by The Tauri Group, the second largest source of demand after "Space Tourism" is "Basic and Applied Research," accounting for about ten percent of forecasted demand. On this particular topic, see Rafael Moro-Aguilar, *The New Commercial Suborbital Vehicles: An Opportunity for Scientific and Microgravity Research*, MICROGRAVITY SCI. & TECH., Nov. 1, 2014, at 219, 219-27.

[6] *See, e.g.*, *Virgin Galactic Rocket Motor Milestone*, VIRGIN GALACTIC (May 23, 2014), http://staging.virgingalactic.com/news/item/virgin-galactic-rocket-motor-milestone/; *In Pictures: XCOR Announces Further Progress on XCOR Lynx Spacecraft*, XCOR AEROSPACE (Dec. 18, 2014), http://xcor.com/press/2014/14-12-18_Lynx_development_in_pictures_carry_through_spar.html; *Updates*, BLUE ORIGIN, http://www.blueorigin.com/updates/; *S3 Concludes 1st Phase Drop-Test Flight Campaign in North Bay*, S3 SWISS SPACE SYSTEMS (Oct. 11, 2014), http://www.s-3.ch/en/home/2014/11/10/s3-concludes-1st-phase-drop-test-flight-campaign-in-north-bay.

[7] *See Virgin Galactic's SpaceShipTwo Crashes in Test Flight: 1 Dead, 1 Injured*, SPACE.COM (Oct. 31, 2014), http://www.space.com/27618-virgin-galactic-spaceshiptwo-crash-kills-pilot.html.

The accident may result in more governmental oversight of firms that seek to launch paying customers to suborbital space. VG itself could be grounded for a while. The National Transportation Safety Board team leading the accident investigation may take up to 12 months to finish its work. VG must then convince the FAA that it has satisfactorily addressed the problems before it can be granted a license for another test flight.[8]

1.2. Is Suborbital Flight an Air or Space Activity?

An analysis of international law applicable to air and space activities reveals that there is currently a lack of regulation specifically addressed to suborbital flight.[9]

In human suborbital flight, the profile apogee culminates at the "edge of space" (although not in an earth orbit). At the present time, no official delimitation exists in international law between airspace and outer space.[10] Therefore, it is not clear as to whether air law or space law applies, and whether suborbital vehicles are aircraft or space objects, especially the ones with mixed (aircraft and spacecraft) characteristics. For this reason, both aviation and space law and treaties have to be analyzed for their applicability with respect to human suborbital flight.

For the time being, manned suborbital flights for leisure purposes are invariably sold as "space tourism," and since they aim to touch the edge of space, they are widely considered by the general public and the media to be a space activity.

However, international space law is ambiguous as to accommodating suborbital activities. On the one hand, the concept of suborbital flight itself is not defined, and the 1967 Outer Space Treaty (OST)[11] does not specify which activities are to be considered space activities. Moreover, some provisions of the United Nations outer space treaties seem to exclude suborbital vehicles, most notably the Registration Convention,[12] which establishes reaching earth's orbit or beyond as a requisite for registration of

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[8] *See Will Space Tourism Survive Virgin Galactic's Tragic Spaceship Crash?*, SPACE.COM (Nov. 6, 2014), http://www.space.com/27651-space-tourism-virgin-galactic-spaceship-crash.html.

[9] Tanja Masson-Zwaan & Rafael Moro-Aguilar, *Regulating Private Human Suborbital Flight at the International and European Level: Tendencies and Suggestions*, 92 ACTA ASTRONAUTICA 243, 243-54, http://dx.doi.org/10.1016/j.actaastro.2012.11.0020.

[10] There have been discussions on this topic at the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) since 1967, without reaching any agreement up to date. On this particular issue, see, for example, FRANCIS LYALL AND PAUL B. LARSEN, SPACE LAW—A TREATISE ch. 6 (2009).

[11] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Resolution 2222(XXI), Jan. 27, 1967, *available at* http://www.unoosa.org/pdf/publications/ST_SPACE_51E.pdf.

[12] Convention on Registration of Objects Launched into Outer Space Resolution 3235 (XXIX), Jan. 14, 1975, *available at* http://www.unoosa.org/pdf/publications/ST_SPACE_51E.pdf.

space objects.[13]

On the other hand, generally speaking, there is no explicit condition in terms of reaching orbit as a requirement for application of international space law. The OST's main provisions refer to "outer space," and not to "orbiting." In particular, reaching orbit does not seem necessary to establish international responsibility and liability of States involved in space activities.[14]

The problem of applying space law to this activity is that international space law has important shortcomings as to regulating private human transportation—in particular, in regulating the legal status and liability of the suborbital operator, crew, and passengers.[15] This gap could become an obstacle to the application of international space law to manned suborbital flight.

International air law could then regulate suborbital transportation. The International Civil Aviation Organization (ICAO) has the legal authority to adopt Standards and Recommended Practices (SARPs) governing all civilian aircraft. In theory, such authority could encompass suborbital (and perhaps even orbital) vehicles in flight traversing airspace.

Indeed, some authors have noted that the Chicago Convention[16] does not place restrictions on the authority of ICAO to regulate civil aircraft simply because the aircraft traverses the upper reaches of Earth's atmosphere. The drafters of the Chicago Convention also acknowledged that challenges relating to international civil aviation, unforeseen at the time of the drafting, would eventually arise. Therefore, ICAO was granted the authority to adapt to these challenges[17] in order to meet the objectives of Article 44 of the Chicago Convention, i.e., "ensuring the safe and orderly growth of international civil aviation."[18]

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13 *Id.* Article II.1.

14 Michael Gerhard, *Article VI*, *in* COLOGNE COMMENTARY ON SPACE LAW—Volume 1: Outer Space Treaty 106-09 (Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrögl eds., 2010).

15 Jürgen Cloppenburg, *Legal Aspects of Space Tourism*, *in* SPACE LAW—CURRENT PROBLEMS AND PERSPECTIVES FOR FUTURE REGULATION 193 (Marietta Benkö & Kai-Uwe Schrögl eds., 2005). On liability issues posed by human suborbital flight, see, for example, Frans von der Dunk, *Passing the Buck to Rogers: International Liability Issues in Private Spaceflight*, 86 Neb. L. Rev. 400, 417 (2007); Stephan Hobe, *Legal Aspects of Space Tourism*, 86 Neb. L. Rev. 439, 439-58 (2007); Michael Chatzipanagiotis, *The Impact of Liability Rules on the Development of Private Commercial Human Spaceflight*, *in* PROCEEDINGS 54TH IISL COLLOQUIUM ON THE LAW OF OUTER SPACE (2011).

16 International Civil Aviation Organization (ICAO), Convention on Civil Aviation (Dec. 1944), 15 U.N.T.S. 295, *available at* http://www.icao.int/icaonet/dcs/7300_cons.pdf [hereinafter Chicago Convention].

17 For instance, Article 37 of the Chicago Convention allows ICAO to adopt and amend SARPs to address "such [other] matters concerned with the safety, regularity, and efficiency of air navigation."

18 Paul Stephen Dempsey & Dr. Michael C. Mineiro, *ICAO's Legal Authority to Regulate Aerospace Vehicles*, *in* PROCEEDINGS 3D IAASS CONFERENCE (2008); Paul Stephen Dempsey & Dr. Michael C. Mineiro, *Space Traffic Management: A Vacuum in Need of Law*, 59th IAC (Glasgow, Scotland 2008).

However, international air law presents equal difficulties in dealing with this activity. In terms of liability, we should consider that the 1929 Warsaw Convention[19] applies only to carriers using "aircraft," and only to "international transportation."[20] The classic definition of "aircraft," as contained in the (non-binding) Annexes 7 and 8 to the Chicago Convention,[21] is "any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the Earth's surface." Such definition does not easily encompass the kind of rocket-powered vehicles that will be used for suborbital flights. Furthermore, insofar as these ventures are promoting purely vertical trajectories and do not intend to cross any international frontiers, the activity hardly qualifies as "international aviation."

But even if air law were to apply, the application of its entire regime, which has evolved over several decades as the aviation industry matured, may be too demanding for the nascent industry of suborbital flight. Operators of suborbital flights would have to comply with numerous rules (international treaties, SARPs, etc.), which may negatively impact the new industry, and create financial and other barriers that it will not be able to cope with at first.

II. NATIONAL REGULATION IN THE UNITED STATES

2.1. National Regulation of Suborbital Flights

In the absence of any international rules, States interested in conducting private manned suborbital flights will regulate this activity within the framework of their domestic law. The law could well be driven by national legislative interests on a domestic level, before possibly reaching the level of international law.[22]

As already noted, in the case of manned suborbital vehicles, the trajectory is essentially vertical, and thus the crossing of any international borders or the overflight of foreign territories can be avoided. As the ICAO Council stated in 2005, "current commercial activities envisage sub-orbital flights departing from and landing at the same place, which may not entail the crossing of foreign airspaces."[23]

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19 Convention for the Unification of Certain Rules Relating to International Carriage by Air, Oct. 12, 1949, 137 L.N.T.S. 11, *available at* http://www.mcgill.ca/files/iasl/warsaw1929.pdf.

20 Convention for the Unification of Certain Rules Relating to International Carriage by Air, Art. 1.

21 For a useful summary of the *Annexes* see Chicago Convention, *supra* note 16.

22 Frans von der Dunk, *Space Tourism, Private Spaceflight and the Law: Key Aspects*, 27 SPACE POL'Y 146, 146-52 (2011).

23 International Civil Aviation Organization, *The Concept of Sub-orbital Flights* 5 (Int'l Civil Aviation Org., Working Paper No. 16 & 14.3.13, 2005).

This will indeed be the case for flights taking place from a large country such as the United States. In such cases, the concerned States will be perfectly capable of regulating the entire activity in the framework of their domestic law. And whether they choose to apply national air law, national space law, or a new hybrid law is up to them.

The situation might well be different for flights operated from, for example, certain European countries having smaller territories. Flight paths may traverse airspace of neighboring states, and incidents or accidents may happen across national borders. The situation will also change when flights go further up, reaching altitudes where satellites usually orbit the earth; or when they ultimately develop into suborbital point-to-point flights to cover very long distances on earth. In all those cases, international law would be applicable, and the choice of regime must be made: air law, space law, or a new *sui generis* regulation combining both legal regimes.

2.2. The Commercial Space Launch Amendments Act

The United States has been a pioneer in enacting specific statutory rules covering the activity of private human suborbital flight.[24]

In October 2004, after successful flights of SpaceShipOne (SS1), the first private aerospace vehicle, the regulation of suborbital passenger vehicles became a matter of practical relevance.[25] There were doubts as to the exact nature of the activity of transporting humans on suborbital trajectories.[26] The proposal was considered for the suborbital regime to be similar to the already existing FAA experimental aircraft regulation (FAR-21). However, at the end the rules were not based on FAR-21; a *sui generis* regulation was the preferred solution, creating a simplified process in order to allow commercial space operators to get off the ground quickly and help develop the industry.[27]

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24 On the U.S. regulation of private human spaceflight, see, for example, FRANCIS LYALL AND PAUL B. LARSEN, SPACE LAW—A TREATISE 131-32, 493-95 (2009); Timothy Robert Hughes & Esta Rosenberg, *Space Travel Law (and Politics): The Evolution of the Commercial Space Launch Amendments Act of 2004*, 31 J. SPACE L. 1, 1-80 (2005); Joanne Irene Gabrynowicz, *One Half Century and Counting: The Evolution of U.S. National Space Law and Three Long-Term Emerging Issues*, 4 HARV. L. & POL'Y REV. 405, 405-26 (2010).

25 Jürgen Cloppenburg, *supra* note 15, at 211.

26 Initially, both air and space legal regimes seemed to apply to this new kind of hybrid vehicles. For *SS1*, the manufacturer (Scaled Composites) was required to obtain space licenses for the launches, and at the same time was required to have an Experimental Airworthiness Certificate (EAC) under 14 CFR parts 21 and 91 for the gliding tests. Some of the flight tests needed a launch vehicle mission license, while others, because of their short-duration engine burning times, were to be conducted solely under the EAC. The EAC did not permit *SS1* to be put into commercial use. This was one of the reasons why *SS1* was never intended to be commercialized.

27 John Sloan, Space Policy Analyst, Federal Aviation Administration, remarks to Orbspace (Nov. 2012). For more insight into the reasoning behind the U.S. 2004 regulation, one can read the preambles found in the documents on the FAA website, see *Office of Commercial Space Transportation Regulations*,

As a result, the U.S. Congress adopted new legislation within the framework of the Commercial Space Launch Act (CSLA), which had been originally enacted in 1984 in order to cover the launch of all non-governmental space rockets.[28] This is because commercial suborbital vehicles have been classified as rockets instead of aircraft, based on distinctions in physics between the "lift" and "thrust" needed to accomplish their trajectory.[29] Accordingly, the CSLA is now the legal basis to regulate all commercial human spaceflight (orbital and suborbital). The term "suborbital" is also separately defined from "orbital" in the law's amendments.[30]

By means of the 2004 Commercial Space Launch Amendments Act (CSLAA),[31] the U.S. Congress granted authority for the regulation and licensing of private human spaceflight to the Office of Commercial Space Transportation of the Federal Aviation Administration (FAA/AST), within the Department of Transportation (DOT).[32] The FAA/AST is a regulatory agency responsible for the licensing of commercial space vehicles' launches and re-entries as well as the operation of private launch and re-entry sites within the U.S.[33]

In the CSLAA, Congress mandated the DOT to issue regulations to carry out the Act.[34] Consequently, a number of federal rules and guidelines have been issued by the FAA/AST.[35] These regulations have set out a series of basic requirements for companies intending to operate these flights, enabling a market to develop. This flexible legal regime will be in force at

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FEDERAL AVIATION ADMINISTRATION, http://www.faa.gov/about/office_org/headquarters_offices/ast/regulations/.

28 Commercial Space Launch Act, 51 U.S.C. §§ 50901-50923 (2011).

29 Section 2(b) of the CSLAA provided the following definition of "suborbital rocket": it means "a vehicle, rocket-propelled in whole or in part, intended for flight on a suborbital trajectory, and the thrust of which is greater than its lift for the majority of the rocket-powered portion of its ascent." 51 U.S.C. § 50902 (2010); *see also* 14 C.F.R. § 401.5 (2015).

30 According to Section 2(b) of the CSLAA, "suborbital trajectory" means "the intentional flight path of a launch vehicle, re-entry vehicle, or any portion thereof, whose vacuum instantaneous impact point does not leave the surface of the Earth." 51 U.S.C. § 50902 (2010); *see also*, 14 C.F.R. § 401.5 (2015).

31 Commercial Space Launch Amendments Act (CSLAA), Pub. L. No. 108-492 (2004).

32 CSLAA Sec. 2(a) "Amendments—Findings And Purposes." The 1984 Commercial Space Launch Act established the DOT as the federal agency responsible for regulating and overseeing the commercial launch vehicle industry.

33 *See infra* note 101, at III ("FAA Licensing for Commercial Space Transportation"); *see also Office of Commercial Space Transportation*, FEDERAL AVIATION ADMINISTRATION, http://ast.faa.gov/lrra/about_lrra.htm.

34 51 U.S.C. § 50922(c) (2010).

35 In particular, the FAA published in December 2006 its Final Rule "Human Space Flight Requirements for Crew and Space Flight Participants," as required by the CSLAA. 71 Fed. Reg. 241 (Dec. 15, 2006); *see also* 17 C.F.R. §§ 401, 415, 431, 435, 440, 450, 460 (2015) (all the regulations applicable to suborbital operators).

least until the end of 2015,[36] and most likely beyond that date. The reason to extend that term is obvious: because suborbital space tourism has not commenced yet, the expected initial experience still has not been gained.

2.3. The FAA Licensing of Manned Suborbital Flights

The CSLAA introduced a legal regime for private spaceflight that for the moment excludes certification of the vehicles, and relies instead on FAA licensing and on the "informed consent" of the participants. The idea was to establish a limited regulation at the beginning, in order to allow for the operators to try and experiment.[37]

The licensing process mostly focuses on safety of public and property not involved in the flights: hence the need for suborbital spacecraft launched from the United States to obtain a license from the FAA/AST.[38] American companies launching from abroad are ordered to comply with the same safety and liability regulations.[39]

The licensing process itself consists of the following steps:[40]

- Pre-application consultation
- Policy review and approval
- Safety review and approval
- Payload review and determination
- Financial responsibility determination
- Environmental review
- Compliance monitoring

The FAA currently has 180 days to make a license determination.[41] A license from the FAA/AST and compliance with a set of safety and other requirements is also mandatory in order to operate a launch and/or reentry site.[42]

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36 § 50905 (6) (C) (3). The provision that prohibits the FAA from issuing further regulations for 8 years after entry into force was extended until 2015 in the FAA Reauthorization Act adopted in February 2012. *See* Dan Leone, *Private Spaceflight 'Learning Curve' Extension Approved*, SPACE NEWS (Feb. 13, 2012), http://spacenews.com/private-spaceflight-learning-curve-extension-approved/.

37 Comments by the Speaker pro tempore (Mr. Kline), California (Mr. Rohrabacher), Texas (Mr. Lampson), House Hearings of November 2004 (on the bill H.R. 5382 that became the CSLAA), Space and Aeronautics Subcommittee of the House Science Committee.

38 51 U.S.C. § 50904. In the case of air-launched concepts such as SS2, the FAA/AST would license the suborbital element as a launch vehicle, while its mothership would operate under an aircraft certificate.

39 Id. at § 50904.

40 Launch or Reentry Vehicles, FAA, http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/launch_reentry/#reusable; *see also* 14 CFR §§ 435.8, 440.

41 51 U.S.C. § 50905 (2010).

42 *Launch Site Pre-Application Consultation*, FAA, http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/launch_site/preapp_consult/; s*ee also* 14 C.F.R. §§ 401, 417,

In addition, the new legislation has introduced an alternative authorization, the so-called "experimental permit," with the aim of facilitating the development of new types of reusable suborbital vehicles.[43] An experimental permit is an authorization issued by the FAA to allow an experimental reusable suborbital rocket to launch or re-enter solely for purposes of testing new design concepts, showing compliance with license requirements, or crew training.[44] Such a permit will not enable the suborbital vehicle to carry "any property or human being for compensation or hire," thereby excluding any commercialization of this particular kind of flights.[45] A permit is issued quicker (120 days) and with fewer requirements than licenses.[46] In addition, a permit ceases to be valid as soon as a license has been granted for that particular design of a reusable suborbital rocket.[47]

Once the license is granted, there is also "compliance monitoring," whereby the FAA makes certain that both the vehicle and the spaceport are operating within the regulations and terms of their licenses.[48] Licenses can be suspended temporarily or revoked permanently if the holder does not comply with the conditions of the license, or if the suspension or revocation is necessary the public health and safety and other national interests.[49] In particular, the FAA/AST may suspend a license when a previous launch or re-entry has resulted in a serious or fatal injury, or when a life support system on board the space vehicle fails and results in a serious accident.[50] The suspension will terminate when the FAA ascertains that the license holder has taken sufficient steps to remedy the cause of the accident, or after the FAA/AST has modified the license.[51] The FAA may modify a license anytime, particularly if new regulations are issued.[52] The FAA can also modify the license to reduce the likelihood of accidents.[53]

The U.S. law makes the crucial distinction between "crew" and "space flight participant" ("an individual, who is not crew, carried within a launch vehicle or reentry vehicle").[54] Crewmembers (either onboard crew or a

420 (2015).

43 51 U.S.C. § 50906.

44 *Id.* at § 50906 (d).

45 *Id.* at § 50906 (h).

46 *Id.* at § 50906 (a).

47 *Id.* at § 50906 (g).

48 *Id.* at § 50907 (a).

49 *Id.* at § 50908 (c).

50 *Id.* at § 50908 (d) (1).

51 *Id.* at § 50908 (d) (2).

52 *Id.* at § 50908 (b).

53 *Id.* at § 50908 (d) (2) (B).

54 *Id.* at § 50902 (2) and (17); 14 C.F.R. §401.5.

remote operator on the ground) must have adequate training.[55] Pilots in particular must have demonstrated an ability to withstand the stresses of spaceflight, as well as any abort or emergency procedures, in sufficient condition to safely carry out their duties so that the vehicle will not harm the public. They must possess an FAA pilot certificate and must also satisfy certain medical certifications.[56]

FAA regulations and guidelines have also addressed safety and security requirements on board, and even some specific aspects of airworthiness of the vehicles involved in private human spaceflight.[57] For instance, there are requirements to provide a controlled cabin environment and an adequate life support system inside the vehicle.[58] FAA regulations also require that suborbital vehicles be designed to prevent the possibility of human error. For instance, flight crew could lose consciousness if subjected to uncontrolled extreme acceleration, noise or vibration: vehicles must therefore be designed and operated so that the crew can tolerate these factors.[59] Finally, an operator must successfully verify the integrated performance of a vehicle's hardware and any software in an operational flight environment (i.e., such verification must include flight-testing) before allowing any space flight participant on board.[60]

The regulations also include training and general security requirements for spaceflight participants. Participants must be trained to respond to emergency situations (smoke, fire, loss of cabin pressure, and emergency exit), and they must not be able to jeopardize the safety of the flight crew or the public.[61] However, participants are not required to undergo any medical examination prior to flying; rather, the FAA relies on the participant's self-interest in obtaining medical advice, until a demonstrable need arises to mandate medical screening through regulation.[62]

2.4. The "Informed Consent" Regime

Most notably, before employing any new crewmembers, the operator

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55 *Id.* at § 50905 (4) (A); 14 C.F.R. §§ 460.5, 460.7.

56 *Id.*

57 The FAA however is not to impose any design requirements or changes in the designs of the vehicles until after 2015, except in case of accidents or incidents involving serious risks ("close calls"). After 2015 (or any other later date established by the legislator), the FAA may propose regulations on space worthiness, operations, and the protection of passenger of private human suborbital vehicles without restriction. In doing that, the FAA must take into consideration the evolving standards of safety in the commercial spaceflight industry.

58 14 C.F.R. § 460.11.

59 *Id.* at § 460.15.

60 *Id.* at § 460.17.

61 *Id.* at §§ 460.51 and 460.53.

62 51 U.S.C. § 50905 (6) (A), (6) (B).

(or the holder of a launch license or permit) for a suborbital vehicle must notify the potential crewmembers that the U.S. federal government has not certified the vehicle as safe.[63] Similarly, before flying any space flight participants, the licensee or permittee must inform the crewmembers in writing about the risks of the flight and notify them that the U.S. federal government has not certified the vehicle as safe.[64] In particular, the FAA regulations require that the spaceflight participant be informed of each known hazard and risk that may result in serious injury, death, disability or total or partial loss of physical or mental function.[65] Passengers must then provide their signed and dated "informed consent" in order to participate in the flight.[66] This "informed consent" will presumably release the operator from liability towards the participants in case of accident during the flight (except in cases of deliberate wrongful action or gross negligence by the operator); however, this is by no means a settled matter.[67]

Because the latter requirement is such an important element of the regulation, the FAA has issued further guidance about what constitutes informed consent.[68] It amounts to a licensing obligation for the operator to clearly inform of dangers inherent in the flight "in a manner that can be readily understood by a participant with no specialized education or training."[69] Informed consent must be based on knowledge of hazards and consequences, risks of launch and re-entry, and the safety record of the particular vehicle and similar vehicles.[70] In addition, licensed operators must also give participants an opportunity to request additional information on accidents and incidents, to orally ask questions to better understand the hazards and risks of the flight, and to receive satisfactory answers to

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63 *Id.* at § 50905 (4) (B); 14 C.F.R. § 460.9.

64 51 U.S.C. § 50905 (5) (A), (5) (B); 14 C.F.R. §§ 460.45(a) and (b).

65 14 CFR § 460.45(a)(1).

66 51 U.S.C. § 50905 (5) (C); 14 C.F.R. § 460.45(f).

67 Contrary to what many people believe, informed consent is not a waiver of claims. Under U.S. federal law, it is a license requirement imposed by the CSLAA and the FAA rule, which operators must meet in order to be able to fly any paying participants aboard their vehicles. Whether the participants' written and signed informed consent will release the operator from liability claims in case of accident is still a matter to be determined by the courts. *See* Letter from Mark W. Bury, Assistant Chief Counsel of International Law, Legislation and Regulations AGC-200, to Courtney B. Graham, Associate General Counsel, National Aeronautics and Space Administration, http://www.faa.gov/about/office_org/headquarters_offices/agc/pol_adjudication/agc200/Interpretations/data/interps/2014/Graham-OGC-NASA %20-%20%282014%29%20Legal%20Interpretation.pdf.

68 *See* APT Research, Inc., Study on Informed Consent for Spaceflight Participants (Doc. No. APT-CFA-230-0001-02F 2008), *available at* http://www.faa.gov/search/?q=APT+Research%2C+Inc.%2C+Study+on+Informed+Consent+for+Spaceflight+Participants; *see also* Tracey L. Knutson, *What Is 'Informed Consent' for Space-Flight Participants in the Soon-to-Launch Space Tourism Industry?*, 33 J. Space L. 105 (2007).

69 14 C.F.R. §460.45 (2006); *see also* APT Research, Inc., *ibid*, at 11.

70 14 C.F.R. §§ 460.45(c) and (d); *see also* APT Research, Inc., *ibid*, at 11-12.

questions prior to flying.[71] The clear intent here is to provide the participants with enough information to allow them to make the voluntary decision to participate and/or encounter these risks.[72]

Several U.S. individual states have enacted additional legislation intended to ensure exclusion from civil liability for suborbital manufacturers and operators launching from their respective territories.[73]

III. NATIONAL REGULATION IN THE FRAMEWORK OF THE EUROPEAN UNION

3.1. Introduction

In the next few years, European countries may be facing the same decisions that the U.S. government had to make in 2004. Several projects are underway in Europe in terms of developing European suborbital vehicles and spaceports. A clear and stable regulatory framework is an essential pre-requisite for investors and operators alike. However, at present such a framework does not exist.[74]

The future European legal framework for commercial suborbital activities should assure the safety of the flights and regulate the consequences of any eventual accidents. At the same time, and in a similar way as the existing U.S. regulation of private human spaceflight, any future European framework should avoid over-regulation, in order not to stifle innovation and to allow for the emergence of the new suborbital industry.[75]

3.2. European Union Law

In 2008, the European Space Agency issued a position paper on "space tourism," suggesting that human suborbital flight should be considered high-altitude aeronautics rather than astronautics.[76]

Should human suborbital flights in Europe be seen as aviation, or air transportation, and suborbital vehicles considered as aircraft, then their

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71 14 C.F.R. §§ 460.45(e) and (f); *see also* APT Research, Inc., *ibid*, at 11.

72 APT Research, Inc., *ibid*, at 10.

73 Virginia (2007), Florida (2008), New Mexico (2010), Texas (2011) Colorado and California (2012).

74 Tanja Masson-Zwaan, Rafael Moro-Aguilar & Aron Lentsch, *The Future Regulation of Suborbital Flight in Europe*, 30 SPACE POL'Y 75, 75-82 (2014); *see also* Michael Gerhard, *Space Tourism—The Authorisation of Suborbital Space Transportation*, NAT'L SPACE LEGIS. IN EUROPE 263, 263-96 (Frans Von der Dunk ed. 2011).

75 Tanja Masson-Zwaan, Rafael Moro-Aguilar & Aron Lentsch, *The Future Regulation of Suborbital Flight in Europe*, 30 SPACE POL'Y 75, 75-82 (2014).

76 EUR. SPACE AGENCY, ESA'S POSITION ON PRIVATELY-FUNDED SUBORBITAL SPACEFLIGHT (2008), *available at* http://esamultimedia.esa.int/docs/gsp/Suborbital_Spaceflight_ESA_Position_Paper_14April08.pdf.

operation could require compliance with the *acquis communautaire*, i.e., the body of European Union (EU) law, since the member States have transferred many powers in the field of civil aviation to the EU.[77]

As far as aviation in the EU is concerned, an extensive regional legal framework has been established to govern civil aviation in Europe.[78] There is Communitary air law regulating a vast number of subjects, through a set of common rules published as Regulations (laws that are directly binding on all member States). The EU is especially active in the fields of economic regulation,[79] and in passenger protection and liability.[80] Furthermore, the EU regulates external relations as well as infrastructure, including slot allocation and the provision of ground handling services, safety and security.[81] In general, the EU rules are more stringent than the provisions in the international air law conventions.

Most notably, the European Aviation Safety Agency (EASA), which is in charge of civil aviation safety in the EU, was created in 2002. According to the applicable "Basic Regulation,"[82] EASA has been established "so that certain tasks currently performed at Community or national level should be carried out by a single specialized expert body."[83] EASA is an independent EU agency[84] engaged in implementing and monitoring safety and environmental protection rules, giving type-certification of aircraft and components, authorizing foreign operators, and giving advice for the drafting of the necessary EU legislation.[85]

In particular, "[T]his Regulation shall apply to: (a) the design, production, maintenance and operation of aeronautical products, parts and appliances, as well as personnel and organisations involved in the design,

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77 T. Masson-Zwaan, R. Moro-Aguilar & A. Lentsch, *supra* note 74, at 76.

78 For a summary of EU legislation in the field of aviation see *Summaries of EU Legislation*, EUROPA, http://europa.eu/legislation_summaries/transport /air_transport/index_en.htm.

79 Regulation No 1008/2008, of the European Parliament and of the Council of 24 September 2008 on common rules for the operation of air services in the Community (Recast), 2008 O.J. (L 293) 3, 20.

80 Regulation No 889/2002, of the European Parliament and of the Council of 13 May 2002 on amending Council Regulation (EC) No 2027/97 on air carrier liability in the event of accidents, 2002 O.J. (L 140) 2, 5.

81 For a useful overview see *European Civil Aviation Handbook: Part I. Regulations and Directives*, EUROPEAN COMMISSION, http://ec.europa.eu/transport/modes/air/internal_market/handbook/part1_en.htm.

82 EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION, REGULATION (EC) NO. 216/2008 OF THE EUROPEAN PARLIAMENT AND THE COUNCIL ON COMMON RULES IN THE FIELD OF AVIATION AND ESTABLISHING A EUROPEAN AVIATION SAFETY AGENCY (2008) (the so-called "Basic Regulation," or "BR"), *available at* http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:079:0001: 0049:EN:PDF.

83 Preamble No. 12 BR.

84 Preamble No. 12 BR; *see also* Article 28.1 BR: "The Agency shall be a body of the Community. It shall have legal personality."

85 Preamble No. 22 BR.

production and maintenance of such products, parts and appliances; (b) personnel and organisations involved in the operation of aircraft."[86] This means that in the European region, EASA has powers over all aircraft and the regulation of aviation safety, including airworthiness, air operations, and flight crew licensing.

3.3. The EASA Proposal to Regulate and Certify "Suborbital Aeroplanes"

A number of EASA officials presented a paper suggesting a regulatory approach within EASA for suborbital flights at the 3rd Conference of the IAASS,[87] held in Rome, Italy in October 2008.[88] This seminal paper was further elaborated in another one, presented at the 61st International Astronautical Congress held in Prague in 2010.[89] It must be stressed that the views expressed in these papers are personal and not officially those of the Agency.

In these papers, the ESA consideration of suborbital flight as an aeronautical activity quoted above is accepted, but the authors would see EASA's involvement limited to rocket-powered winged airplanes, calling them "Sub-orbital Aeroplanes" (SoA). This approach excludes unwinged, pure rockets, and thus all suborbital ventures using the concept of a vertical launch.[90]

The authors of these papers hold that suborbital aeroplanes generating aerodynamic lift during the atmospheric part of the flight must be considered as aircraft, as per the ICAO definition of aircraft quoted above.[91] Therefore, their airworthiness, crews and operations fall under the powers of EASA, and the Agency must fulfill its role in relation to civil suborbital flights, aircrafts, and operations.[92] Indeed, according to EASA's Basic Regulation, all aircraft used for commercial purposes in Europe must be certified (even those intended for purely national flights), and EASA has the mandate to certify

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86 Article 1.1 BR. See also Articles 17 *et seq.* BR on the functions of the Agency.

87 *See* INTERNATIONAL ASSOCIATION FOR THE ADVANCEMENT OF SPACE SAFETY (IAASS), http://iaass.space-safety.org/.

88 Jean-Bruno Marciacq, Yves Morier, Filippo Tomasello, Dr. Zsuzsanna Erdelyi & Dr. Michael Gerhard, *Accommodating Sub-orbital Flights into the EASA Regulatory System,* http://www.congrex.nl/08a11/presentations/day1_S09/S09_05_Marciacq.pdf; *see also EASA's Space Tourism Approach Requires Certification*, FLIGHT GLOBAL (Oct. 28, 2008, 7:00 PM), http://www.flightglobal.com/articles/2008/10/28/317902/easas-space-tourism-approach-requires-certification.html.

89 Jean-Bruno Marciacq, Yves Morier, Filippo Tomasello, Dr. Zsuzsanna Erdelyi & Dr. Michael Gerhard, *Towards Regulating Sub-orbital Flights—An Updated EASA Approach, in* Space Transportation Solutions and Innovations, Presented at the 61st IAC (Oct. 2010).

90 Jean-Bruno Marciacq et al., *supra* note 88, Abstract.

91 *Id.*, Abstract and 2.2.2 (EASA role and procedures).

92 *Id.*, Abstract.

them.[93] In order to do so, the authors consider that EASA should complement existing rules to capture the specific features of SoA, rather than developing new specifications from scratch.[94] As this kind of aircraft is designed for a special purpose, and a normal type certificate on the basis of existing certification requirements for standard aeroplanes may be inappropriate, restricted type certificates seem the most realistic avenue for certifying SoA.[95] The aim would be to ensure an equivalent level of safety as currently pertains to existing aeroplanes, as far as possible considering the inherent risks linked to such endeavors at the outer limit of the atmosphere and the novelty of this domain.[96]

Finally, the authors claim that EASA would not have competence for the (very short) outer space part of sub-orbital flight, which remains under the authority of individual member States; unless it agrees with the States to enforce this responsibility on their behalf.[97]

EASA representatives have explained that their investigations on a regulatory approach for human suborbital flight started in 2007, following an initiative taken by the industry itself, when some (unnamed) potential applicants approached EASA for guidance and for possible certification of their spaceplane designs. Accordingly, EASA is ready to provide its services in the field of suborbital flight, if a mandate to that extent and the corresponding resources are provided by the European Commission.[98]

It should be noted however that in September 2011, the European Commission put EASA's suborbital activity on hold, due to a new directive from the Commissioner's Cabinet to investigate a lighter process, similar to the FAA/AST "Launch Licensing" procedure.[99] As of early 2015, a final decision on this matter by the European Commission is still pending.[100]

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93 *Id*., at 2.2 (Aviation Law in the European Union).

94 *Id*., at 1 (Introduction).

95 *Id*., at 3.1 and 3.2 (Airworthiness and Certification). Certification requirements for standard airplanes in the EASA regulatory system are called CS-23 for small (<5.7t) and CS-25 for large (>5.7t) airplanes. Both would be taken into account by EASA to define a basic airworthiness code for SoA.

96 *Id.*

97 *Id.*, at 3.3 (Legal Implications When Entering Outer Space).

98 Jean-Bruno Marciacq, European Aviation Safety Agency, remarks made to Orbspace (2010 & 2012).

99 *See 1st European Aviation Safety Plan (EASp) Implementation and Review Summit*, EUROPEAN AVIATION SAFETY AGENCY, at 49, *available at* http://easa.europa.eu/sms/docs/European%20Aviation%20Safety%20Plan%20(EASp)%202012-2015%20-v1.0%20FINAL.pdf. Several European stakeholders however have confirmed their demand for full certification: EADS, Booster, S3, and Reaction Engines Ltd.-Skylon.

100 In this context, it is interesting to note that the European Commission recognized EASA's authority to regulate another kind of vehicle of which it was hard to define whether it is an aircraft or something else, namely Unmanned Aerial Systems (UAS, sometimes also referred to as UAV). The EU might do the same in the future for suborbital vehicles.

IV. PATHS FOR AUTHORIZATION OF PRIVATE SUBORBITAL FLIGHTS

4.1. The "Licensing Versus Certification" Debate

As already noted, two paths for authorization of private suborbital flights have been under consideration both in the U.S. and in Europe: certification and licensing.

Certification of aircraft is most effective in assuring safety of aerial vehicles, as demonstrated by the extremely low rate of accidents that happen in modern aviation. However, certification is a lengthy and costly procedure (as it requires exhaustive testing, paperwork, etc.) that may not be suitable at the beginning for the kind of experimental, rocket-powered vehicles that is under discussion here.

In order to make a decision, one should take into account the fact that human suborbital flight will be, at least in the beginning, a rather small market; and even though its main application—i.e., "space tourism"—looks promising, its commercial value is still unproven.[101]

Another consideration is that manned suborbital flight is a new, still not well known activity, and thus it becomes necessary to learn more before imposing comprehensive regulations in the field. In the U.S., legislation was intended as a compromise between the safety of the public (third parties) and freedom of innovation for the vehicle developers. Accordingly, commercial operators will be able to fly for a number of years before the FAA formulates stricter regulations based on the experience gained.[102]

Furthermore, suborbital tourism is only one initial financing means found by the industry to develop new suborbital concepts, with the goal in mind to apply the same technology to other broad public concepts at a later stage, such as hypersonic point-to-point transportation and orbital commercial spaceflight. This view of an evolving technology seems to speak again in favor of a step-by-step approach, so that the law may closely follow the progressive technological developments.

In the U.S., the FAA is prepared to codify any lessons learned during the first few years of operations, while under the moratorium set up by Congress. The current licensing regime is set to evolve to include regulations for occupant safety, on top of the existing ones, which are meant for public safety only. This could be hastened if there is an accident. Industry involvement and input into any future regulatory effort is seen as critical prior

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101 George Nield et al., *Certification Versus Licensing for Human Space Flight in Commercial Space Transportation*, *in* 63rd International Astronautical Congress 1, 4 (2012), http://www.faa.gov/about/office_org/headquarters_offices/ast/programs/international_affairs/media/Certification_vs_Licensing_Nield_FAA-IAC-Naples-Oct-2-2012.pdf.

102 *Id.* at IV and V.

to any formal proposal by the FAA. This "learn-as-you-go" approach could serve as a model for regulation also in other nations.[103]

Another aspect to consider is that if the U.S. and Europe adopt divergent approaches to regulating the emerging commercial human spaceflight industry, companies wishing to fly on both sides of the Atlantic will be forced to operate in very different regulatory environments. Vehicles may have to be developed in accordance with two different sets of regulations; and passengers will be treated differently depending on which country they are flying from.[104]

In addition, having to obtain two authorizations if two sets of regulations (FAA's and EASA's) apply to companies operating in both U.S. and Europe, may be detrimental to the suborbital business. Burdensome regulations will be an additional expense, which will be added to ticket prices.

On the other hand, even though the FAA and EASA may start off with different regulatory approaches, eventually the FAA will also fully regulate human suborbital flight (at some point after 2015) and theoretically will publish its own certification rules. All along this transitionary period, EASA has declared itself to be ready to collaborate with the FAA in order to ensure maximum coordination and harmonisation of both regulations.[105]

One more issue to take into account is that almost half of the suborbital vehicle concepts currently being developed and tested are without wings. The existence of vertically launched, unwinged concepts, such as those of Masten or Blue Origin, is an important consideration. In order to avoid any regulatory discrimination, EU law should also cover unwinged vehicles. As noted above, EASA does not cover purely rocket designs (since they do not generate lift as symmetrical bodies, they are not aircraft according to the ICAO definition). Therefore, such vehicles would fall under the powers of the corresponding national authority. This implies that in Europe, there could, potentially, be two different sets of rules and two different authorities regulating the same activity—commercial human suborbital flight. This would be an undesirable consequence.[106]

In this context, it should be recalled that in the U.S., the same body (the FAA) regulates aviation and space. In the EU, this is not the case: the

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103 *Id.*

104 On this particular issue, see, for example, *Big US-Euro Divide on Commercial Spaceflight Regulations*, PARABOLIC ARC, http://www.parabolicarc.com/2011/05/13/big-useuro-divide-commercial-spaceflight-regulations/. The 2014 U.K. CAA report (to be analyzed below) also touches upon this issue, by saying in p. 37 that "given that the designs of the spaceplanes that are most likely to launch from the U.K. by 2018 or earlier have been developed in line with the U.S. model [of legislation], any regulation we propose should be compatible with this model."

105 Interview by Orbspace with Jean-Bruno Marciacq, Coordinator, Suborbital and Orbital Aircraft, EASA (2012).

106 T. Masson-Zwaan, R. Moro-Aguilar & A. Lentsch, *supra* note 74, at 81.

Member States oversee space activities, while EASA has authority over aviation.

To solve this problem, EASA could be given a role with regard to regulation and authorization of commercial spaceflight, in order to include suborbital flight in the mandate of the Agency. The EU can increase EASA's authority, and actually this has happened several times since the Agency was created. The goal would be to set up an agency having a similar role in Europe to the one played by the FAA/AST in the U.S.

A new "Space Transportation Department" within EASA would be in charge of the European framework for commercial suborbital flights by granting authorization of private human spaceflight at the European level, ensuring harmonization of standards and safety of the flights carrying passengers, and serving as the European center for all topics of relevance concerning the regulation of these activities and their success in practice.[107] It would also develop cooperation with the FAA in this field, and at the European level, it could ensure close relations with the national offices for commercial suborbital activities that may be created under each national civil aviation authority or space agency.[108]

4.2. Results of the 2012 Survey Conducted in Europe on Suborbital Flight Authorization

In the context of the EU-financed FAST20XX research project,[109] a survey called "FAST20XX Questionnaire on Human Suborbital Flight" was co-organized by Orbspace (Vienna, Austria) and the International Institute of Air and Space Law (University of Leiden, Netherlands), in order to gain further information on these matters. This Questionnaire was sent in February 2012 to a number of potentially interested stakeholders all over Europe. A total of 30 responses were received. The respondents were grouped as follows: manufacturers and/or operators of vehicles, national and European regulators, insurers, consultants, users, and lobbyists.[110]

According to the vast majority of responses received, it is better to have in place one single legal regime applying to suborbital activities, regardless of the phase of the flight (i.e., air space or outer space), and regardless of the

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107 Julie Abou Yehia & Kai-Uwe Schrögl, *European Regulation for Private Human Spaceflight in the Context of Space Traffic Management*, 66 ACTA ASTRONAUTICA 1622 (2010).

108 *Id.*

109 FAST20XX Summary, EUROPEAN SPACE AGENCY, http://www.esa.int/Our_Activities/Space_Engineering_Technology/FAST20XX_Summary.

110 For a more comprehensive explanation of the background and the results of this survey, see T. Masson-Zwaan, R. Moro-Aguilar & A. Lentsch, *supra* note 74, at 77 *et seq*. See also the related report *Future regulatory framework for suborbital flights in Europe, available at* http://esamultimedia.esa.int/docs/space_engineering/Summary_SoF_oct2012_final.pdf.

type of suborbital vehicle performing the flight (i.e., whether taking off horizontally or launched vertically). Also, as long as the market remains relatively small, almost all stakeholders agreed that initial regulation should be "light-touch" in order to avoid constraining progress and innovation. This approach would seemingly exclude the requirement of full certification of the vehicles at the beginning of the activity.[111]

A step-by-step regulatory approach, to be reviewed after some years, was the option preferred by most stakeholders, in order to go along with the technical evolution and to facilitate the industry to emerge. Safety rules in particular should be developed gradually, as technology progresses and new knowledge and new needs arise. A flexible framework for development, testing and initial operation is desirable at this point, in order not to constrain innovation.[112]

Nevertheless, most respondents favored regulating from the beginning all the core topics that were indicated in the questionnaire: liability, jurisdiction, legal status of crew and passengers, launch authorization and licensing of crews and vehicles, registration of vehicles, rules on operations, and insurance requirements. An adequate regulatory framework, no matter how light and flexible, should not ignore any of those relevant matters. As noted by EASA in its reply to the Questionnaire, the basic principles (responsibilities of the operator; oversight by the authority) could be adopted at the legislative level, while operational and technical details could remain at the level of non-legally binding rules, adapted to different concepts and operations.[113]

Virtually all respondents agreed that accidents have the potential to make a huge difference on the evolution of the future legal regime: this is very significant. Other factors are not so obvious however. Passenger demand and flight rates might also make a difference, but it is not so clear as in the case of accidents. Location of the flights would not be a significant influence. As for the number and size of companies, some respondents hinted that a fair regulation should allow the presence of players of all sizes in the suborbital field, and not be addressed (or be favorable) only to the largest operators.[114]

Responses to the question: "Is the 'informed-consent' regime adopted in the USA under the 2004 CSLAA also desirable in Europe? Is it possible to have such a regime in Europe?" showed a definite trend in favor of the U.S. "informed consent" approach. Affirmative responses included most respondents, and even included EASA itself. One of the respondents added a

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111 T. Masson-Zwaan, R. Moro-Aguilar & A. Lentsch, *supra* note 74, at 77.

112 *Id.*

113 *Id.*

114 *Id.*

comment, which may be considered as representative of the general opinion: "Let's give the participants the presumption that they are informed and have assumed the risk they will encounter by boarding a flight."[115]

In contrast, and even though a step-by-step approach seems to be favored by most stakeholders, several industry representatives declared that they would prefer to set up a complete regulatory regime from the beginning for the sake of legal certainty, instead of having a temporary regime that may be changed after a few years, thus impacting negatively investors and operators. Those entities (manufacturers and/or operators) are aiming at full certification of their suborbital spaceplanes from the start of operations, so that requirements once set will remain unchanged, and design would be (so to speak) "frozen." In that context, they consider that the EASA approach for authorization of suborbital aeroplanes (SoA) is the most adequate for their concepts.[116]

Concerning the need for a European institution regulating suborbital flight, the same industry representatives favor EASA, while recommending keeping close contact with the FAA for their expertise. They also believe that it is preferable to adopt a lessons-learned approach, thereby incorporating into the suborbital field all the knowledge gained by the aviation sector.[117]

Additionally, although generally seen as a good compromise between safety and regulatory flexibility, the U.S. "informed consent" rule also drew some criticism. Reasons alleged by one representative from a European consortium to consider that approach as not desirable were that "this is in practice a de-regulation approach," and that "the CSLAA is not robust enough because of the loopholes left in terms of liability to passengers. Therefore, the rest of the world is unlikely to follow the U.S. model to suborbital regulation."[118]

However, those pushing for certification from the very beginning seem to ignore the fact that rocket-based propulsion systems are currently less reliable, and therefore less apt for certification, than the jet engines used in modern aviation.[119] Aviation got much safer over the years as the flight hours accumulated. Similarly, more flying time should lower the risks for rocket propulsion and for human spaceflight. But this may take a fair amount of

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115 *Id.*

116 *Id. See also* Christophe Chavagnac & Thierry Pichard, Oral Presentation, *Aeronautics vs. Space-like Safety of Flight: What Really Matters*, IAC-12, D6, 1, 6, x16299 (2012).

117 T. Masson-Zwaan, R. Moro-Aguilar & A. Lentsch, *supra* note 74.

118 James Murray, *Regulating Suborbital Commercial Spaceflight*, 12 INT'L BAR ASSOC. SPACE L. NEWSLETTER 1, 9-12 (2012).

119 T. Masson-Zwaan, R. Moro-Aguilar & A. Lentsch, *supra* note 74. On this specific aspect, see, for example, U.K. CIVIL AVIATION AUTH., U.K. GOVERNMENT REVIEW OF COMMERCIAL SPACEPLANE CERTIFICATION AND OPERATIONS (2014), *available at* http://www.caa.co.uk/. *See* discussion, *infra* Part 5.2.

time. In the meantime, some authors remind us, human suborbital flight will continue to be more dangerous than commercial aviation, if only because spaceflight tests are much more expensive (and therefore much less numerous) than airplane flights.[120]

In the longer term, if it ever becomes a possibility, the goal would be to have all suborbital vehicles carrying passengers certified as safe, mirroring the manner that civil aircraft is currently certified. The industry itself is interested in having vehicles certified as safe. But in order to achieve that, certification of the designs must be possible (insofar as a mature technology exists), and there must be a steady business to pay off the additional costs of certifying the new vehicles. A certification regime works best for vehicles that are mass-produced.[121]

One compromise solution for authorization of suborbital flights in the EU is mandating EASA to establish a temporary licensing process, before adopting a full certification approach at some point in the future. The adoption of a temporary licensing approach comparable with the one adopted in the USA would have the benefit of leading to a harmonized international regime, rendering Europe attractive as a home base for all operators of suborbital flights.

However, implementing on a European level the "informed consent" regime used in the U.S. would be particularly challenging, and it would require a firm legislative commitment on behalf of the EU. There is currently no European Community legislation that is similar to the 2004 CSLAA and thus could serve as the legislative basis for adopting such an approach on a EU-wide scale.[122]

V. NATIONAL REGULATION OF PRIVATE SUBORBITAL FLIGHT

5.1. General Considerations

One solution for the EU is that those European States with a particular interest in the activity could take the lead, assuming that other countries will follow afterwards, rather than trying to seek to coordinate all European states at the same time, as most of them have very little interest in commercial suborbital flight at the moment.

Indeed, recent events seem to indicate a willingness by certain EU Member States to regulate this activity by themselves, at least during the initial phase of operations.

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120 Mike Wall, *Will Space Tourism Survive Virgin Galactic's Tragic Spaceship Crash?*, SPACE.COM (Nov. 6, 2014), http://www.space.com/27651-space-tourism-virgin-galactic-spaceship-crash.html.

121 *See* Nield, *supra* note 101, at IV.

122 T. Masson-Zwaan, R. Moro-Aguilar & A. Lentsch, *supra* note 74, at 80.

Certain EU Member States may consider that suborbital vehicles are more akin to spacecraft and should be regulated under their domestic, or national, space laws. Other EU member States, while acknowledging that spaceplanes are more akin to aircraft, may still establish some national arrangements on their own, particularly if no specific guidance or policy at EU-wide level has been provided in this field.

Those EU Member States that prefer to regulate suborbital flights as spaceflight, will have to make sure that they have space legislation in place that covers such flights. As of early 2015, only half a dozen European States have enacted national space laws, and none of them addresses suborbital flight.[123] Therefore, if human suborbital flight is to start being regulated in Europe on a purely national level, it seems desirable that interested member States adopt some space legislation that covers this activity. They will have to elaborate a national space law and a national space licensing regime, both of which specifically addressing also suborbital flight.

National laws are likely to follow the step-by-step approach adopted by the U.S. legislation, and establish an initial authorization scheme based on the licensing of commercial flights, with an aim to ensure general safety of the vehicles and to protect third parties from the potential dangers of human suborbital flights. The concerned European countries may also enact legislation covering the main legal aspects such as passenger liability, mandatory insurance for operators, jurisdiction on board, registration of the vehicles, etc.

Other issues such as suborbital passengers' pre-flight health and fitness tests, passengers' training, or passengers' personal insurance may instead be subject to self-regulation or become customary practices in the suborbital transportation industry.

In principle, it would be desirable that some level of uniformity exists among the rules set up in the different European countries. However, the Lisbon Treaty that entered into force in 2009 established that the EU is not to undertake any harmonization of the space laws and regulations of the Member States.[124] As an alternative, a realistic approach for concerted action

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123 The following EU member States have enacted national space legislation: Sweden (Act on Space Activities, 1982), United Kingdom (Outer Space Act, 1986), Belgium (Law on the Activities of Launching, Flight Operations or Guidance of Space Objects, 2005), The Netherlands (Law on Rules Concerning Space Activities and the Establishment of a Registry of Space Objects of 2006), France (Space Operations Act, 2008), and Austria (Austrian Outer Space Act, 2011). Spain is also in the process of elaborating a national space law. *See* discussion *infra* Part 5.3. Only the Dutch Law of 2006 makes a brief mention of an eventual inclusion within its scope of commercial human space activities, in its section 2.2.b). See for a useful overview of national space legislations: *National Space Law Database*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS (UNOOSA), http://www.oosa.unvienna.org/oosa/en/SpaceLaw/national/state-index.html.

124 Treaty on the Functioning of the European Union art. 189.2, Dec. 13, 2007, C 306 O.J.

within the EU might be seen in cooperation and coordination of the legislating States. This could be done through intergovernmental agreements between the legislating States, or if that is not feasible, at least on the basis of frequent consultations (formal and informal) of the governments of such States.

5.2. United Kingdom's Report on Spaceplanes

An important update on the British position regarding commercial spaceflight (both orbital and suborbital) arrived in July 2014, with the publication of a report prepared by the U.K. Civil Aviation Authority (U.K. CAA), assisted by the U.K. Space Agency (UKSA).[125] The report is titled "United Kingdom's government review of commercial spaceplane certification and operations."[126]

The U.K. government had declared before that it wants the U.K. to become the European center for "space tourism."[127] Launch activities are not currently carried out in any part of the U.K. or its dependent territories. However, several exciting ventures have been proposed, such as the possibility of VG scheduling private human suborbital flights from Scotland, and the development of orbital and suborbital spaceplanes[128] by two local companies: Bristol Spaceplanes, and Reaction Engines Ltd.-Skylon.

Consequently, the U.K. CAA received the mandate to inform the British government and the key stakeholders about how the U.K. could accommodate future commercial spaceplane operations from its territory, while establishing the appropriate regulatory framework that would allow this to happen.[129] In the resulting report, the U.K. CAA has included a series of findings and recommendations for a U.K. regulatory framework, on the basis of its own research, carried out through visits to the FAA/AST, NASA, EASA, several spaceports, and spacecraft developers such as VG and XCOR.[130]

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125 U.K. CAA: http://www.caa.co.uk/. UKSA: https://www.gov.uk/government/organisations/uk-space-agency.

126 U.K. CIVIL AVIATION AUTH., U.K. GOVERNMENT REVIEW OF COMMERCIAL SPACEPLANE CERTIFICATION AND OPERATIONS (2014). The report comes in two versions: CAP1189 (full technical report) and CAP1198 (summary and conclusions). The present analysis will refer to the latter only: http://www.caa.co.uk/docs/33/CAP1198_spaceplane_certification_and_operations_summary.pdf.

127 U.K. government, *Plan for Growth*, DEPARTMENT FOR INNOVATION AND SKILLS (2011): www.gov.uk/government/uploads/system/uploads/attachment_data/file/31584/2011budget_growth.pdf. The Plan for Growth also recognized the need "to define regulations for novel space vehicles that offer low cost access to space."

128 "Spaceplane" is defined in the U.K. CAA report as "reusable, winged vehicles that act as an aircraft while in the atmosphere and as spacecraft while in space." The report covers both orbital and suborbital projects.

129 U.K. CIVIL AVIATION AUTH., *supra* note 126, at 4, 12-13.

130 *Id.* at 5.

Recognizing that the current legislation (both at the EU and the U.K. level) does not fully address spaceplanes,[131] the U.K. CAA has encouraged the European Commission in the past to develop a regulatory framework for orbital and suborbital spaceplanes. The possibility of certifying the spaceplanes seems to be favored by the U.K. authorities.

Indeed, it is the view of the CAA legal experts that spaceplanes meet the ICAO definition of "aircraft," and the carriage of paying passengers would be deemed to be public transport (or commercial aviation).[132] Therefore, it has been determined that the existing body of civil aviation safety regulation would apply to spaceplanes. As a result, EASA is seen as the competent regulatory authority within the EU, which should ultimately take the lead for all aviation matters.

However, at this stage of their development, commercial spaceplanes cannot comply with all of the existing commercial aviation regulations.[133] In the absence of an EU decision regarding EASA's proposal, the U.K., exercising its sovereignty, has made the decision that its national law could handle the lack of regulations in the interim period.[134] The U.K. will align regulation of initial suborbital activities on the basis of the U.S. model, utilizing a similar case-by-case licensing scheme.

To enable spaceplane operations to start from the U.K. in the short term, the report recommends that suborbital spaceplanes are classified as "experimental aircraft" under the EASA Basic Regulation.[135] This effectively takes them out of core civil aviation safety regulation, and allows the U.K. to regulate them at a national level for the short term. This exemption would be valid until at least the 2020s.[136]

In fact, EU member States have the possibility to exclude certain aircraft from the Basic Regulation, by considering them as "aircraft specifically designed or modified for research, experimental or scientific purposes, and likely to be produced in very limited numbers."[137] EU member States might decide to apply this legal exclusion to suborbital vehicles, and retain their regulation in the national jurisdiction.

The report acknowledges the fact that experimental aircraft are not

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131 *Id.* at 32.

132 *Id.* at 33.

133 *Id.*

134 *Id.* at 39.

135 EASA's Basic Regulation, *supra* note 82. 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, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC.

136 U.K. CIVIL AVIATION AUTH., *supra* note 126, at 6, 9, 33-34.

137 EASA's Basic Regulation, *supra* note 82, at Art. 4.4, Annex II b.

typically allowed to conduct operations of public transportation of passengers. However, once these aircraft have been excluded from EU regulation, suborbital transportation of passengers in experimental aircraft could be allowed by issuing exemptions and attaching special conditions to the spaceplane operations under U.K. national air law (the Civil Aviation Act 1982 and the Air Navigation Order, ANO).[138]

The report goes on by declaring that the U.K. government must accept that spaceflight operations carry a higher degree of risk than routine aviation activities. Commercial spaceplanes cannot currently achieve the same safety standards as commercial aviation, and may never be able to. Once this risk is accepted, then protecting the uninvolved general public becomes the highest safety priority. This is the same regulatory approach that has been adopted by the FAA/AST.[139]

Suborbital flights would be possible by informing crew and participants (the U.S. nomenclature is adopted in the report) of the inherent risks before the flight; they will in turn acknowledge in writing receipt of this information and accept that they will not benefit from the normal safeguards expected of public transport. In other words, the U.K. government should adopt the principle of "informed consent" to allow in the short term the carriage of participants and cargo on suborbital spaceplanes.[140]

The report however also expresses that, since there will be future EU regulation in the field, and given the U.K. legal view that spaceplanes are aircraft, the U.K. should not adopt the FAA/AST framework as a whole or in the long term for the regulation of commercial suborbital spaceplane operations, but instead the U.K. should remain in step with future developments of spaceplane legislation by the EU.[141] Once EU spaceplane regulations and certification are mature, it is anticipated that they will replace the proposed U.K. regulatory framework.[142]

The report recommends that "the work to develop a permissive regulatory framework must commence immediately," so that the U.K. is ready to allow the start of operations by 2018 or even earlier.[143] Initial operations would be enabled under wet lease type arrangements,[144] by giving

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138 U.K. CIVIL AVIATION AUTH., *supra* note 126, at 7, 9, 34.

139 *Id.* at 35.

140 *Id.* at 34, 40.

141 *Id.* at 39.

142 *Id.* at 46.

143 *Id.* at 7.

144 In a wet lease type of arrangement, the U.S. operator of a suborbital spaceplane would lease the vehicle together with its flight crew and its maintenance staff to a local operator. The U.S. operator would be responsible for the entire operation, even though the vehicle would be departing from the U.K. or any other territory outside the U.S. This arrangement has the merit of being in compliance with the U.S. International Traffic in Arms Regulations (ITAR) constraints.

due recognition to FAA/AST safety standards and operating procedures, while employing also U.K. CAA standards and procedures.[145]

The report details some of the key elements of the proposed national temporary regulatory framework, including the adoption of a safety management system for spaceplane airworthiness in the U.K.,[146] and the need for conducting spaceplane operations (launches and re-entries) in segregated areas of airspace, as U.K. national airspace is one of the busiest in the world.[147] Additional points would be: supporting development of hybrid rocket engines in the U.K.; undertaking a full environmental impact assessment for each spaceplane type at each launch location; validating the FAA/AST process around flight crew licensing, and investing in training facilities for spaceflight crew in the U.K.; developing the medical requirements for crew members; and appointing a single regulator or competent authority for all spaceflight operations.[148]

Finally, one of the most important factors in protecting the uninvolved general public is the choice of a location for a U.K. launch site, or spaceport. The report provides criteria for the selection of suitable spaceports (in terms of traffic volume, population density, weather patterns, etc.). It recommends that initial operations should take place from an already existing operational aerodrome, preferably on a coastal location.[149]

The report is extremely informative and interesting. There are two potential problems in the proposed plan however. From a practical point of view, the date that is set for commencement of suborbital operations in the U.K.—the year 2018—seems too optimistic now, after the accident suffered by VG in the U.S. VG was surely one of the operators—perhaps the main operator—that were expected to start flying their vehicles on a wet-lease basis from Britain in the short term.

From a legal perspective, the main problem of the approach recommended by the U.K. CAA may lie in the proposed procedure for exclusion of spaceplanes from the EASA Basic Regulation, and thus from application of EU air law. One could question whether suborbital vehicles that are officially considered as aircraft and are used for purposes of commercial transportation of passengers can become exempt from EASA certification under Annex II of the Basic Regulation. They are intended to carry passengers in regularly scheduled flights on a commercial, for-profit basis; their flights resemble too much a kind of commercial aviation, as the

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145 U.K. CIVIL AVIATION AUTH., *supra* note 126, at 43.

146 *Id.* at 42, 44.

147 *Id.* at 47-49.

148 *Id.*

149 *Id.* at 8; *see also Industry Backs Government's Spaceport Plans*, GOV.UK (Mar. 3, 2015), https://www.gov.uk/government/news/industry-backs-governments-spaceport-plans.

report itself admits. However, provided that the proposed exemption is not just a matter of legal interpretation, but it is also subject to the decision making of the concerned member States, then it could become a reality.

5.3. Spain's Draft Bill on Outer Space Activities

Spain is another nation that could see suborbital ventures departing from its territory in the next few years. Spain offers potential suborbital operators a favorable climate and a welcoming social and governmental environment, as well as being one of the top countries in the world in terms of numbers of tourists visiting each year.

In the case of Spain, no local vehicles are currently under development, but at least one international operator, the Swiss company S3, has announced that it will conduct suborbital launches from the Canary Islands.[150] The European consortium Booster Space Industries also had the intention to launch from an undisclosed location in Spain.[151] Additionally, plans existed by the Catalan government regarding the partial conversion of the Lleida airport to a suborbital spaceport.[152] Consequently, a law was passed in 2009, at the regional Parliament, granting the Catalan government authority to promote and develop space tourism and other space related activities at local airports.[153]

From a legislative perspective, the most significant development is the existence of a draft bill regulating private space activities, which is under discussion in Spain since early 2014.[154] The Spanish Ministry of Public Works and Transportation is responsible for this initiative. The draft includes a domestic regulation of private manned suborbital flights, which basically follows the model put in place by the U.S. CSLAA. Officials of the Spanish Ministry have been in contact with the U.S. FAA in order to gain advice and collaborate with their U.S. counterparts.

The Preamble declares that the aim of this law is twofold: regulation and promotion of private space activities. The latter activities expressly include "the utilization of suborbital trajectories." The definition of "launching" in the law also explicitly includes "launching on a suborbital trajectory."

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150 *Swiss Space Systems S3 Develops Its Activities in Spain and Strengthens Its Networks of Spanish Partners*, S3, http://www.s-3.ch/en/home/2013/12/12/swiss-space-systems-s3-develops-its-activities-in-spain-and-strengthens-its-network-of-spanish-partners.

151 *See* James Jason Murray, *Message from our Founder Dr. James Jason Murray*, BOOSTER SPACE INDUSTRIES, http://www.boosterindustries.eu/consortium/booster-space-industries/.

152 http://www.aeroportlleida.cat/index.php?id=22&L=2.

153 *See* http://www.boe.es/diario_boe/txt.php?id=BOE-A-2009-13566, at art. 26.2 and Additional Provision No. 8.

154 The draft bill is not yet publicly available. The author had access to the text in his capacity as a member of a group of experts advising the Spanish Ministry on the drafting of the law.

Finally, "suborbital flight" itself is also defined in the law as "those flights that do not enter into earth's orbit but have as their primary goal to perform an activity in an area which is bordering what can be considered as outer space."

The two regulatory approaches of the projected Spanish commercial suborbital regulation are the same ones adopted in the U.S. CSLAA:

1) A launch-like licensing scheme would be established, with the Spanish Civil Aviation Authority[155] of the Ministry of Public Works and Transportation in charge of granting "authorizations" (similar to the U.S. licensing process) for launching, operating and recovering space objects and vehicles. Such authorizations will enable companies to commercially operate manned reusable suborbital vehicles departing from and landing on Spanish territory. An authorization is also required for operating a launching and recovery site, i.e., a spaceport.

According to the draft, an authorization is granted after the applicant has provided all the necessary documentation and, in particular, has shown that the proposed activity does not violate public policy and national defense and meets a series of safety, environmental, financial, and civil liability insurance requirements that are set up in the law. The Ministry has six months to make a decision on the proposed space activity. The authorization will also enforce the necessary restrictions in the airspace for the phases of launch and recovery of the space object or suborbital vehicle. The authorization may be suspended or revoked in case of non-compliance with its terms or with national and international space law. A scheme of supervision of operators and their activities is also set up in the law, as well as a system of sanctions, which are proportional to the infractions that may be committed by the operators.

2) An "informed consent" regime is also established in the draft, whereby all the participants (the U.S. nomenclature is also adopted here) in a commercial spaceflight must be previously informed of the inherent risks of this activity and then must provide their consent in writing to fly under such conditions. As a consequence, the participants assume their own risks and may not file any claim, in court or out of court, against the operator or against the Spanish government. The operator will be released of liability in case of an accident, except in cases of gross negligence or deliberate wrongful action by the operator.[156]

The proposed law also includes provisions for the case of a suborbital

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155 *See* AVIACIÓN CIVIL, FOMENTO, http://www.fomento.gob.es/mfom/lang_castellano/direcciones_generales/aviacion_civil/direccion_general_de_aviacion_civil/.

156 Unlike U.S. federal law, the Spanish bill has adopted the interpretation that informed consent releases not only the government but also the operator from liability claims by the participants or their families. *See supra* note 67.

flight conducted by means of two vehicles that are initially attached: one of them (incapable of reaching outer space) used as a platform for launching, and the other one capable of reaching and operating in outer space. The first vehicle will be considered as a conventional aircraft and the second one as a space object. Each one will be governed separately by its own applicable legal regime. However, the characterization of the whole mission and, consequently, the inclusion of the mission in the scope of the law, derives from the final destination of the space component of the mission.

The Spanish draft space bill also contemplates the possibility of establishing a "fast-track" experimental permit regime similar to the one introduced by the CSLAA in the U.S. However, the text of the law does not elaborate on this option. It leaves its full development for a future implementation regulation that will be prepared by the Ministry in the next few years.

Finally, a system of (capped) third party liability for operators (both orbital and suborbital) is also established under the law.

Both the U.K. government proposed interim regime and the Spanish draft space bill adopt the two crucial distinctions made by the U.S. CSLAA: on the one hand, the difference between "orbital" and "suborbital," (although the majority of rules and procedures are common for both types of flight); and on the other hand, the distinction between "crew" and "flight participants." This is noteworthy, as neither of those terms and distinctions exist in the UN outer space treaties, or in international space law in general. If adopted in the future by the national laws of other countries as well, the two distinctions may eventually become rules of customary international law.

5.4. Other Countries

A number of other suborbital projects have been announced around the world. In several cases, the announcements were accompanied by news of associated legislative developments.

First of all, a Memorandum of Understanding was signed on January 26, 2007, between the governmental entity Spaceport Sweden and suborbital operator VG, concerning the latter's manned suborbital flights taking off and landing in this spaceport.[157]

The only launch activities currently carried out in Swedish territory are launches of unmanned suborbital sounding rockets in the Esrange spaceport close to Kiruna, in the far north of the country, and they are explicitly

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[157] Peter B. de Selding, *Virgin Galactic Strikes Deal with Swedish Government*, SPACE.COM (Jan. 28, 2007), http://www.space.com/3395-virgin-galactic-strikes-deal-swedish-government.html. See also Spaceport Sweden's website describing a pioneering initiative to establish commercial human spaceflight in Kiruna and become Europe's gateway to space, available at http://www.spaceportsweden.com/.

excluded from the scope of the Swedish Outer Space Act.[158] Third party liability for any damages caused by sounding rocket flights would be handled by the Swedish general legal framework, but in reality the risks are very small. Launches only take place in an area of extremely low population density, and thus are not considered a hazard to third parties, including aviation. However, should manned suborbital flights start taking place in Sweden, then the issue of second-party liability, i.e., liability from the operator towards passengers, would have to be solved as well.[159]

In this context, it is interesting to remark that the MoU called for the Swedish government to establish a favorable regulatory regime modeled on that of the FAA.[160] However, as of 2015, there were no news of the development of any such regime.

It is also interesting to note that Spaceport Sweden, in charge of the launch site located in Kiruna, urged EASA and FAA to come to a common policy for handling the new vehicles. Otherwise, suborbital space tourism flights in Europe could become delayed decades into the future. In their opinion, the requirement of certification could jeopardize the mutual recognition of suborbital vehicles, and thus the "third country approval" of foreign vehicles, something that Spaceport Sweden needs in order to open its facility to VG's vehicles.[161]

Belgium is another EU member State that had to examine recently the issue of human suborbital flight, as one prospective European operator, Booster Space Industries, has its headquarters in Brussels.[162] In 2013, the Belgian government decided to exclude suborbital flights from its national space legislation.[163] After that amendment, the Belgian law only considers space objects (and therefore subject to its provisions), those that are destined to earth's orbit or beyond.[164] This seems to imply that the Belgian

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158 Swedish Act on Space Activities, sec. 1.3, 1982.

159 *See* Rob Coppinger, *Spaceport Sweden Could Class SpaceShipTwo as Sounding Rocket*, SERADATA SPACE INTELLIGENCE (July 10, 2008), http://seradata.com/SSI/2008/07/spaceport_sweden/; Mattias Abrahamsson, Oral Presentation, Operating Commercial Space Tourism Vehicles from Sweden—Regulatory Challenges, Address at the 61st. International Astronautical Congress (Oct. 1, 2010), *in* 13 61ST. INTERNATIONAL ASTRONAUTICAL CONGRESS 2010.

160 *See* Peter de Selding & Tariq Malik, *Virgin, Swedish Spaceport Sign Deal for Suborbital Flights*, SPACE NEWS (Feb. 5, 2007), http://www.space.com/spacenews/archive07/virginsweden_0205.html.

161 Mattias Abrahamsson, *supra* note 159.

162 *See* Murray, *supra* note 151.

163 Koninklijk besluit houdende uitvoering van sommige bepalingen van de 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] Moniteur Belge [M.B.] [Official Gazette of Belgium], Nov. 4, 2008, 1182.

164 For consolidated text of the Belgian Law, as amended by the Law of 1 December 2013, see

government considers suborbital flight as an aeronautical activity, subject to air law.

In October 2010, an agreement was announced between U.S. suborbital manufacturer and operator XCOR Aerospace and the Dutch company Space Expedition Corporation (SXC), intending to offer to the public the experience of human space travel from Curaçao, an island in the Caribbean Sea. Passengers would fly on-board XCOR's *Lynx*, to be operated under a wet lease agreement reached between the two entities.[165]

At the same time, news appeared that the government of the Dutch Antilles–where Curaçao is located–was drafting its own national space law.[166] Given the lack of EU policy and of EASA regulation, the FAA model of regulation had been chosen. A draft law was expected to be ready for approval by the Curaçao government by April 2013, and the first licenses were expected to be delivered in December 2013, so that flights could start in 2014.[167] However, it appears that the plans have halted as no updates have been reported.[168]

There are also some projects of spaceports in the Asian region, such as Daejeon (South Korea) and Spaceport Malaysia.[169] No project of an

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Law of 17 September 2005 on the Activities of Launching, Flight Operations or Guidance of Space Objects, available at https://www.belspo.be/belspo/space/doc/beLaw/Loi_en.pdf.

165 *See Space Experience Curaçao Announces Wet Lease of Xcor's Lynx Suborbital Spacecraft* (Oct. 5, 2010), XCOR, http://xcor.com/press/2010/10-10-05_Space_Experience_Curacao_announces_wet_lease_of_lynx.html; *Xcor Aerospace and Space Expedition Curaçao Sign Eight-Figure Wet Lease Contract for Lynx Suborbital Spacecraft* (Sept. 19, 2011), XCOR, http://xcor.com/press/2011/11-09-19_XCOR_and_SXC_sign_eight_figure_wet_lease_for_lynx.html.

166 In this context, it must be noted that the Dutch 2007 "Space Activities Act" mentioned *supra* in note 123 applies only to the European part of the Kingdom of the Netherlands, thereby expressly excluding the overseas territories of Aruba and the Dutch Antilles. (*See* Explanatory memorandum accompanying the Dutch Law, paragraph 3.8.). In addition, in 2010 the island of Curaçao obtained the status of independent country within the Kingdom of the Netherlands.

167 *See* Aviation Independent Consulting, *Aviation Independent Consulting BV Signed a Consultancy Contract with Curacao Airport Holding* (Aug. 25, 2012), http://www.aicbv.com/news/13-aviation-independent-consulting-bv-signed-a-consultancy-contract-with-curacao-airport-holding-cah; Space Expedition Corporation, Space Law Contract Signed by Curaçao Airport Holding (Aug. 21, 2012), http://www.spacexc.com/en/media/news/space-law-contract-signed-by-curacao-airport-holdi/; F. von der Dunk, *Mixing US and Dutch Approaches: Towards Curaçao's Legislation on Private Commercial Spaceflight*, German Journal of Air and Space Law, ZLW 62. Jg. 4/2013, http://www.researchgate.net/publication/228125798_Mixing_US_and_Dutch_Approaches_Towards_Curaaos_Legislation_on_Private_Commercial_Spaceflight.

168 In the meantime, XCOR Aerospace acquired SXC (including all operational subsidiaries) in 2014; the resulting company, XCOR Space Expeditions, will be the worldwide sales entity of XCOR. *See* http://xcor.com/press/2014/14-06-30_xcor_acquires_space_expedition_corporation.html; *see* Eva Van Pelt, *Xcor Aerospace Acquires Space Expedition Corporation*, XCOR (June 30, 2014), http://www.xcor.com/news/xcor-aerospace-acquires-space-expedition-corporation/.

169 *See* Bryan Campen*, South Korean Space Center Selects Xcor's Lynx for Suborbital Operations,* XCOR (Dec. 17, 2009), http://www.xcor.com/news/south-korean-space-center-selects-xcors-lynx-for-suborbital-operations/; *see generally* http://spaceportmalaysia.com/v2/.

accompanying domestic legislation for human spaceflight has been announced in either of those countries.

VI. CONCLUSIONS

In the future, and insofar as private human suborbital flights can be expected to have trans-boundary effects, international law will apply to them. However, as of today their classification as either aviation or space activity remains unclear.

As long as there are no international rules on manned suborbital flight, national law will regulate this activity. In view of the current lack of specific national legislation in any country, except for the USA, nations that are interested in this activity should enact domestic laws regulating private human suborbital flight.

With regard to Europe there is, for the time being, no EU law governing suborbital flights. Therefore, member States are free in principle to regulate those flights, either as aviation or as a space activity. In the former case, the EU aviation rules would also become applicable, as well as EASA's competence in the field of safety regulation, except in the case that EU member States decide to exclude suborbital vehicles from EU's powers, on the basis of Annex II to the Basic Regulation.

On the other hand, adopting in European countries and elsewhere a launch-like licensing process similar to the one established in the U.S. in 2004 seems to be the most appropriate solution, given the current state of the emerging industry. Adopting such a legal regime would have the benefit of providing all those countries with a level playing field with the U.S., rendering them attractive as a home base for suborbital flights.

As demonstrated by the accident suffered by VG in 2014, safety is—together with an adequate regulation—the biggest challenge faced by the emerging suborbital flight industry. If the industry fails to convince the public that it is safe enough, suborbital tourism will remain as a niche activity catering to a very small number of affluent and high-risk-taking people. But if manned suborbital flight proves to be sufficiently safe within the next decade, then an increasing number of people will participate in this activity, and suborbital flight will definitely consolidate as a strong branch of the aerospace sector. The words of Alan Stern, former NASA Associate Administrator for Science, will then become a reality: "A new type of human spaceflight is rising before our eyes. It is something few could have predicted 20 or even 10 years ago, yet it was right under our noses: suborbital spaceflight."[170]

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170 S. Alan Stern, *Celebrate Suborbital*, THE SPACE REVIEW (Mar. 22, 2010), http://www.thespacereview.com/article/1589/1.