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SUBORBITAL (NON-ORBITAL) SPACEFLIGHT ACTIVITIES

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SUBORBITAL (NON-ORBITAL) SPACEFLIGHT ACTIVITIES

I. Introduction

In this final report, the Committee brings together its work on the legal aspects of a relatively new technological area on the verge between airflight and spaceflight: suborbital (non-orbital) activities.

I. General overview of the legal problems related to suborbital (spaceflight) activities

1. Scope of application

The Rules drafted by the ILA Space Law Committee shall be applicable to suborbital spaceflight activities. Such activities are characterized by the fact that while the vehicle enabling the activity is intended to leave airspace and result in activities related to the exploration and use of outer space, it does not, however, aim to go into or complete a full orbit around the Earth, or go beyond Earth orbit. Its flightpath follows a parabolic trajectory and is completed when the vehicle returns to Earth. Because the suborbital activity is aimed to at least “reach” outer space and in some cases to have a direct effect in outer space, it is categorized as an activity in the exploration and use of outer space, and hence as a type of space activities.

The most common examples for suborbital spaceflight vehicles are the concepts designed for commercial suborbital spaceflight developed by Virgin Galactic and Blue Origin. These activities should be distinguished from other activities that bring vehicles to fly in a parabolic trajectory, such as, for example, high-altitude platforms; sounding rockets or balloons that reach higher atmospheric regions without getting even close to achieving one orbit around the Earth; spacecraft designed to carry out deep space missions that can leave near-Earth space before completing one full rotation around the Earth. It is important to note that even though intercontinental ballistic missiles (ICBMs) may reach space at a velocity close to the orbital velocity, they are not to be considered suborbital spaceflight vehicles within the scope of these Draft Rules, as their activity is generally not considered a space activity.

As noted in the explanatory remarks for the definition of ‘suborbital spaceflight activity’, the Rules use the term suborbital to refer, not to activities that take place below a certain orbital altitude, but to activities that whose velocity does not allow them, by design, to complete an orbit around Earth. For this reason, the term ‘non-orbital activities’ could also be used, as this term more directly relates to the distinguishing criterion for these activities. However, since the common terminology broadly uses the term ‘suborbital’, this language shall be retained here as well, with the understanding that the prefix ‘sub’ relates more strongly to the velocity than to altitude.
2. The current status of relevant regulation

The regulation of suborbital spaceflight activities poses a long list of unresolved issues that require legal consideration. Some of them have been discussed in fora such as ICAO, UNCOPUOS and UNOOSA on the international level, and have been also tackled by national authorities, e.g. the U.S. Federal Aviation Administration. These unresolved issues concern both general as well as specific questions stemming from the fact that suborbital spaceflight activities are a new concept that does not completely fall within the scope of established fields of law, such as air law and space law. They include, inter alia, the following aspects:

1. the lack of clarity regarding the applicable (international) law;

2. the relevance of air law and space law;

3. the relationship between national legislation and the applicable international law to suborbital (spaceflight) activities;

4. the lack of legally binding definitions clarifying relevant terms such as, e.g., ‘suborbital vehicle’, ‘suborbital spaceflight’ and ‘suborbital activity’;

5. the scope and possible elements of a potential sui generis legal order;

6. the question of a competent regulatory authority;

7. the scope of a comprehensive liability and insurance regime for suborbital (spaceflight) activities;

8. the need for a registration regime for suborbital (spaceflight) activities;

9. the need for an extensive authorization regime guaranteeing the “air/space-worthiness” of suborbital vehicles as well as the coordination between air traffic and space traffic, incl. objects using the so-called meso-space (e.g. HAPS and high-altitude balloons);

10. the status of different categories of persons participating in suborbital (spaceflight) activities (e.g. pilots/commanders, trained crew, passengers/spaceflight participants);

11. policies applicable to persons onboard a suborbital spaceflight vehicle;

12. various aspects of space transportation (i.e. transportation between two points on Earth, through space) as an application of suborbital (spaceflight) activities.

13. policies applicable to passengers onboard of a suborbital vehicle;

14. various aspects of space transportation (i.e. transportation between two points on Earth, through outer space) as an application of suborbital (spaceflight) activities.
II. Rules and explanatory remarks on suborbital (Non-Orbital) Spaceflight Activities

1. Definitions

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<th>Article 1</th>
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<td><strong>Definitions</strong></td>
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<tr>
<td>a) A suborbital spaceflight activity is any activity [in outer space] involving a parabolic flight (from Earth) that is not intended to complete an orbit around Earth.</td>
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<tr>
<td>b) A suborbital spaceflight vehicle is any object performing a suborbital spaceflight activity [that is intended to operate in outer space].</td>
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<td>c) A suborbital operator is the entity, governmental or non-governmental, performing a suborbital spaceflight activity.</td>
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a) ‘suborbital spaceflight activity’

With reference to the (not legally binding) working definition of ‘suborbital flight’ proposed by ICAO¹, a suborbital spaceflight activity can be defined as:

<table>
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<th>Article 1 para. a)</th>
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<tr>
<td><strong>Definition of ‘suborbital spaceflight activity’</strong></td>
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<tr>
<td>A suborbital spaceflight activity is any activity [intended to operate in outer space] involving a parabolic flight that is not intended to complete an orbit around Earth.</td>
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**Explanatory remarks:**

i) *Velocity rather than altitude is the defining criterion for suborbital*

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¹ ICAO defines suborbital flight as a “flight up to a very high altitude which does not involve sending the vehicle into orbit”, see ICAO Council – 175th Session, Concept of Sub-Orbital Flights, Working Paper C-WP/12436, May 5, 2005, p. 2 and Concept of Suborbital Flights: Information from the International Civil Aviation Organization (ICAO), paper A/AC.105/C.2/2010/CRP.9, presented at the 49th session of the Legal Subcommittee of UNCOPUOS, 19 March 2010.
spaceflight activities

Despite lengthy discussions in various international forums, there is no commonly fixed altitude above the surface of the Earth which can be reliably considered to constitute a boundary between airspace and outer space. Moreover, altitude is not the most well-suited criterion to define a suborbital spaceflight activity considering that suborbital concepts will develop, and in the future higher vehicles may reach higher altitudes in the course of their non-orbital spaceflight trajectory. The highest altitude that a suborbital vehicle may reach during its parabolic flight should hence not be a determining criterion to define a suborbital spaceflight activity.²

Some regulatory proposals and national laws do refer to altitude as a criterion of differentiation between space activities and suborbital spaceflight activities. For example, the New Zealand Outer Space and High Altitude Activities Act from 2017, without a direct reference to suborbital spaceflight or suborbital activities, regulates the licensing of activities reaching altitudes above flight level 600⁹ or above the highest upper limit of controlled airspace.³ The Act defines ‘high-altitude vehicle’ as “an aircraft or any other vehicle that travels, is intended to travel, or is capable of travelling to high altitude”.⁴ Moreover, the 2018 UK Space Industry Act⁵ applies to a “rocket or other craft that is capable of operating above the stratosphere”¹⁶ thus referring to the upper strata of Earth’s atmosphere as a distinctive physical criterion.

Likewise, the 2010 ICAO proposal on the concept of suborbital flights⁷ also includes a reference to altitude as a relevant criterion for defining this notion in its relationship to aircraft activities, yet clarifies that such criterion is not sufficient to distinguish it from activities performed by registered space objects. As a result, the proposal defines a suborbital flight as “a flight up to a very high altitude which does not involve sending the vehicle into orbit”.⁸

² The lowest point in a viable orbit completed by a satellite lies at 84 km, and some suborbital vehicles have crossed the von Kármán line, generally accepted to refer to an altitude of approximately 100 km. For example, Virgin Galactic’s SpaceShipOne reached 100, 102, and 112 km during three test flights in 2004, see https://airandspace.si.edu/collection-objects/spaceshipone. Blue Origin’s New Shepard reached 105 km during its 12th test flight in December 2019, see https://www.blueorigin.com/new-shepard/. Although Theodore van Kármán originally had introduced 50 miles (approx. 80 km) as the altitude at which the atmosphere is so thin that aircraft cannot be sustained by aerodynamic forces and thus separates aeronautics from astronautics, through the modified reference of the Fédération Aéronautique Internationale (FAI), the altitude of 100 km became widely known as the “von Kármán line”. The FAA, for example, sets the von Kármán line lower – at 50 miles. More recently, arguments have been made to re-establish von Kármán’s original definition. See, Jonathan McDowell, “The Edge of Space: Revisiting the Karman Line”, Acta Astronautica 151 (2018), pp. 668-677.
³ Ibid., Section 4, ‘high-altitude’, alt. (b.)
⁴ Outer Space and High-altitude Activities Act 2017, Section 4, ‘high-altitude vehicle’ and Section 88 (1) (13).
⁵ UK Space Industry Act, Chapter 5, Section 1 “Introduction”, Subsections (4) and (6).
⁶ UK Space Industry Act, Chapter 5, Section 1 “Introduction”, Subsection (5).
The 2019 UAE Federal Act on the Regulation of the Space Sector follows a similar approach and provides separate definitions for ‘orbital spaceflight’ (‘A Spaceflight with the intention of completing an orbit around the Earth’) and ‘sub-orbital flight’ (‘A Spaceflight with the intent to enter the Specified Area without the intention of completing an orbit around the Earth’). Thereby, the UAE law relies not only on the altitude of 80 km at which the specified area starts, but specifically refers to the aim of completing an orbit as the decisive criterion.9

From these examples, it becomes evident that while some proposals (of New Zealand and the UK) suggest that suborbital activities are characterized by the altitude the vehicle reaches, other regulatory approaches (of ICAO and the UAE) refer also to the lack of intention to complete an orbit around the Earth during the activity. The critical importance of the orbital velocity as opposed to the altitude of the suborbital vehicle is reflected in the definition offered by the US legislator, which defines ‘suborbital trajectory’ as “[t]he 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”.10

With a view to offering a flexible and comprehensive regulatory approach in creating these draft rules for suborbital spaceflight activities, it is essential to take into account the fact that the exact altitude reached by a suborbital spaceflight vehicle may vary depending on different suborbital (vehicle) concepts11 and that it may change as technology advances. Furthermore, irrespective of whether it is a scientifically viable approach or not, the international progress of negotiations on the topic of delimitation between airspace and outer space has shown that a consensus on setting the ‘boundary’ of outer space or defining an area based on altitude will probably not be reached in the near future.12

Thus, while altitude is a relevant criterion to circumscribe suborbital spaceflight activities, in particular in their relationship to other activities typically performed by aircraft, it is neither the only, nor the most relevant criterion for defining these activities. Indeed, it should be recognized that for defining suborbital spaceflight activities, more important than altitude considerations is the fact that the spaceflight vehicle is not intended to reach a velocity sufficient to complete a full orbit

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10 U.S.C, Title 51, §50902(23). The vacuum instantaneous impact point should be understood as the impact point, following thrust termination of a launch vehicle, calculated in the absence of atmospheric drag effects. A 2014 Spanish draft Bill on Outer Space Activities that was not made into law defines suborbital flights as “flights that do not enter into Earth’s orbit but have their primary goal to perform an activity in an area which is bordering what can be considered as outer space”. Rafael Moro-Aguilar, National Regulation of Private Suborbital Flights: A Fresh View. FIU Law Review, Vol. 10, No. 2, Art. 18, 2015, p. 707.

11 See, supra 1.

12 UN COPUOS, Historical Summary on the consideration of the question on the definition and delimitation of outer space, UN Doc. A/AC.105/769 (2002).
around the Earth. Further, differently from aircraft, such vehicles are also not sustained through aerodynamic drag during the (whole) duration of their parabolic flight.\textsuperscript{13}

\[ \text{ii) 'Suborbital spaceflight activity' vs. 'suborbital flight'} \]

Suborbital spaceflight activities are approached in these draft rules as a subset of space activities, as they refer to activities that have as their objective a form of exploration or use of outer space, as understood by the UN treaties on outer space. They can be distinguished from other types of space activities in that they use vehicles (or composite vehicle concepts) that are capable of operating in outer space, yet without the aim of completing a full orbit around Earth, or going beyond Earth orbit.

For the purpose of these draft rules, the notion ‘suborbital spaceflight activity’ is therefore used instead of the narrower term ‘suborbital flight’ included in some of the legislative proposals quoted in the previous section.

The 2018 UK Space Industry Act refers to suborbital activities\textsuperscript{14} as different from space activities, but establishes common rules and procedures for their licensing. Furthermore, as the key distinctive feature for suborbital spaceflight activities is velocity (higher vis-à-vis flight of aircraft, but lower than needed for the orbital motion of space objects),\textsuperscript{15} no specific differentiation shall be made with regard to the purpose of the suborbital spaceflight activity as scientific (e.g. for tests, scientific microgravity experiments, in-flight test purposes, astronauts training), touristic, commercial or military, to name but a few. On the applicability of international law, see below under Article 2.

\textsuperscript{13} Whether aerodynamic drag plays a role at least for one part of the activity, depends on the concept applied. Vertical take-off/vertical landing (VTVL) suborbital vehicles are launched and landed like rockets. Horizontal take-off/horizontal landing (HTHL) suborbital vehicles rely heavily on aerodynamic drag as they use a runway for take-off and landing, similarly to airplanes. The combined vertical take-off/horizontal landing (VTHL) concept is used for vehicles using thrust for launch which can land on a runway and thus use aerodynamic drag during the landing phase. For the definition used in the US legislation, see 51USC § 50902(25): “suborbital trajectory” means the intentional flight path of a launch vehicle, reentry vehicle, or any portion thereof, whose vacuum instantaneous impact point does not leave the surface of the Earth.”

\textsuperscript{14} Suborbital activity is defined as the “launching, procuring the launch of, operating or procuring the return to Earth of a [...] rocket or other craft that is capable of operating above the stratosphere, a balloon that is capable of reaching the stratosphere carrying crew or passengers, or an aircraft carrying such a craft, but does not include space activity”, UK Space Industry Act, I (4).

\textsuperscript{15} As pointed out by the IAASS, suborbital flights are flights “up to an altitude at which the vehicle does not reach orbital velocity”, IAASS, Safety Design and Operation of Suborbital Vehicles guidelines, October 7, 2015.
iii) Not every parabolic flight is a suborbital spaceflight activity

The wording used in Article 1 para. a) – “A suborbital spaceflight activity (...) not intended to complete an orbit around Earth” underlines the relevant link between suborbital spaceflight activities and outer space. This link is confirmed, for example, by the US law which links (manned) suborbital spaceflight to space launches by defining ‘launch’ as placing or the attempt of placing “a launch vehicle or a reentry vehicle and any payload or human being from Earth in a suborbital trajectory, in Earth orbit in outer space; or otherwise on outer space”.¹⁶

There are other types of suborbital flights which are sent into parabolic trajectory, such as, for example, experimental rockets or fireworks that may reach only low altitudes of a few dozen meters or kilometers. Such cases are not to be regulated herein.¹⁷ These draft rules refer specifically to suborbital spaceflight activities carried out by vehicles that can employ a velocity high enough to “reach” or come close to outer space, but which is nevertheless lower than the velocity needed to complete a full orbit around the Earth, including the possibility to reach a different point on Earth than the initial starting point of the flight for transportation aims.¹⁸

The phrase ‘not intended to complete an orbit around Earth’ should be read in conjunction with the parabolic nature of the intended flight, so that the definition clearly does not include such space activities that, while not completing an orbit around Earth either, have as their intended flightpath a trajectory beyond Earth orbit through outer space (e.g. robotic interstellar probes such as the ones launched in the Voyager program).

b) ‘suborbital spaceflight vehicle’

For the purposes of these draft rules, a suborbital spaceflight vehicle could be defined as:

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¹⁶ United States Code, Title 51, §50902 (7).
¹⁷ See, in particular Section II.1. above.
¹⁸ Plans for such forms of point-to-point transportation between two points on Earth, through space, have been announced by companies such as SpaceX, Blue Origin and Virgin Galactic (together with NASA and The Spaceship Company, see the Space Agreement (SAA), with more concepts by other actors expected to follow.
A suborbital spaceflight vehicle is any object performing a suborbital spaceflight activity.

**Explanatory remarks:** The neutral notion ‘suborbital spaceflight vehicle’ is used in order to differentiate vehicles used for suborbital spaceflight activities from aircraft and from space objects, without linking such vehicles to either air law or space law.

Suborbital spaceflight vehicles may be constructed and functioning according to various technological concepts (e.g. VTVL, HTHL or VTHL). This may include vehicles operating as aircraft for a part of their operation (i.e. horizontal take-off and/or horizontal landing), vehicles that do not classify as aircraft for any portion of the operation (i.e. vertical take-off and/or vertical landing of suborbital rockets), and also composite vehicles consisting of a carrier craft (airplane) and a rocket-engine vehicle used for the parabolic part of the flight.

As the existing concepts are non-exclusive, the proposed definition is kept general and with a focus on the purpose of use, in order to encompass all possible technological varieties for vehicles which can be used for suborbital spaceflight activities - without aiming at defining the vehicle either as an aircraft or as a space object.

c) **Suborbital operator**

A suborbital operator is the entity, governmental or non-governmental, performing a suborbital spaceflight activity.

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19 *See, supra 1.*

20 The most famous example for a composite suborbital vehicle is the concept that won the X Prize in 2004, SpaceShipOne/White Knight, and its successor SpaceShipTwo/White Knight Two (in test flight since 2013, but not yet operating).
Explanatory remarks: As suborbital spaceflight activities take place at least partly outside national territory and airspace, it is necessary to associate the entity exercising the activity (irrespective of the fact whether it is governmental or non-governmental) with a State. This ‘attribution’, resp. ‘allocation’, of the suborbital operator to a given State can be established on the basis of registration of the entity. The State in which the entity is registered must not necessarily be the same as a State(s) that authorizes the suborbital spaceflight activity according to Articles 3 and 4, and which registers the suborbital spaceflight vehicle under Article 5 (as there may be more than one authorizing State).

2. Applicability of international law to suborbital spaceflight activities

Article 2

Applicability of international law

International law is applicable to suborbital spaceflight activities.

Explanatory remarks: To the extent that activities performed by suborbital spaceflight vehicles should be characterized as space activities, the relevant rules of international space law will be applicable to these activities. Accordingly, unless specific provisions of international law exist, general international law will be applicable to suborbital spaceflight activities to the extent that they transcend national airspace. The transboundary character of suborbital spaceflight activities may require a specific international legal regime that uses concepts of both air law and space law, also in an analogous form, where suitable and necessary. For those phases of suborbital spaceflight activities that take place in the airspace or otherwise on the territory of (a) State(s), the domestic legal system of such States must be respected as well.

3. Authorization of suborbital spaceflight activities

a) Authorizing State(s)
Article 3

Authorizing State(s)

Every suborbital spaceflight activity must be authorized by the appropriate State and the State(s) on whose territory or from whose facility the activity, or part(s) of it, is performed.

Explanatory remarks: As suborbital spaceflight activities involve various significant risks which may materialize on Earth, in airspace or at a higher altitude, an extensive regime for governmental authorization has to be established. Such a regime will allow national authorities to apply strict criteria to suborbital operators, the suborbital spaceflight vehicles and to the parameters of the intended suborbital spaceflight activities. Thereby, the competence for authorization is derived from space law\textsuperscript{21}, which requires space activities to be authorized by the appropriate State.

Due to the close link between the activity in its various phases (e.g launch/take-off/landing), on the one hand, and the territory of one or more States, on the other hand, it is presumed that the identification of the appropriate authorizing State(s) will be based primarily on the territorial jurisdiction of those State(s).

While the State in which all or part of the activity takes place will thus have to authorize the suborbital activity, it might be that other States would also be involved as appropriate State(s). This might be the case when, for example, some phases of the suborbital spaceflight activity take place entirely above the high seas or other areas outside national jurisdiction.

It should be clarified that the nature of certain types of suborbital spaceflight activities may allow to identify multiple States as authorizing States, for those parts of the activity that take place in their airspace or otherwise on their territory. This is the case, for example, with regard to the phase between launch/take-off and landing when the launch/take-off and landing take place in the territory of more than one State. Thereby, the duty of authorization is linked to the element of control of the respective States over their territory and facilities, be they involved as the State of take-off/landing, or any other States whose airspace would be used for the purpose or in the course of suborbital transportation. In the case of multiple authorizing States for the same activity, rules should be put in place that avoid duplicative requirements.

In these draft rules, the use of the verb ‘perform’ is preferred to ‘launch’ or ‘take off’ in order to encompass the different concepts for suborbital spaceflight vehicles, including those that do not necessarily involve a launch and may instead use an aircraft as part of a composite vehicle.\textsuperscript{22} Unlike

\textsuperscript{21} Art. VI Outer Space Treaty.
\textsuperscript{22} As is the case with Virgin Galactic’s SpaceShip/WhiteKnight composite suborbital vehicle series
one-time vehicle registration of ships and aircraft, due to the complex potential hazards that may result from suborbital spaceflight activities, Article 3 requires that every suborbital spaceflight activity is authorized, subject to the specific regulations of national authorization regimes (see Article 4). In addition, Article 5 of these draft rules provides for the national registration of suborbital spaceflight vehicles for purposes of enhancing transparency and enabling international coordination.

b) Common minimum requirements for authorization

Article 4
Common Elements of Authorization

(1) The criteria which States shall apply when deciding on the authorization of suborbital spaceflight activities shall concern both the activity and the vehicle. The activity-related criteria shall include:

(a) Main purpose of the activity;
(b) Route description: altitude/trajectory/time of suborbital spaceflight and landing location;
(c) Obligation for coordination with air traffic control;
(d) Type of cargo/number of crew members and spaceflight participants;
(e) Qualification of commanders, crew members and spaceflight participants;
(f) Requirement of insurance for third-party liability of the suborbital space vehicle and of any person participating in the activity through the operator.

With regard to the suborbital spaceflight vehicle, safety requirements, such as air/space worthiness, disclosure of main design features shall be examined.

(2) States may impose other conditions relating to public interests, such as public safety, public health, environmental protection, national foreign policy or security interests, at their own discretion and with respect for the international obligations of the State.

(3) In addition, any aircraft used in the performance of suborbital spaceflight activities must be authorized according to all appropriate technical criteria according to Annexes 6 and 8 of the Chicago Convention.
**Explanatory remarks:** A minimum of requirements to suborbital operators with regard both to the planned activities and to the vehicles should be established on the international level to enhance harmonization and a generally valid standard for States authorizing national suborbital spaceflight activities. The implementing method could be similar to the one used in the Chicago Convention with its Annexes, according to Art. 38, 39 and 90 of the Convention, to enable a quick adaptation to the most current safety standards. At the same time, as foreseen in Article 4 para. 2, States should have margin to consider additional conditions, in order to take responsibility for the respective activity. This has been done, for example, in the US legislation which leaves it to the discretion of the Government to issue additional regulations “governing the design [...] of a launch vehicle to protect the health and safety of crew, government astronauts, and spaceflight participants”. Also, the 2018 UK Space Industry Act\(^ \text{23} \) puts an emphasis on public safety and the safety of third-parties.\(^ \text{24} \)

Due to the potentially hazardous nature of suborbital spaceflight activities, it is not recommendable to leave it to each State to decide whether an insurance requirement, *inter alia* for third-party liability, must be included in national legislation or not. Thus, specific provisions on the obligation to conclude an insurance policy are *conditio sine qua non* for any future regulation and must be included in national legislation. However, the specific conditions and requirements as to the scope of the insurance can be decided on the national level.

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\(^ {23} \) Space Industry Act, Section 2(1).
\(^ {24} \) Space Industry Act, Section 9(4)(a) and (b)
4. Registration of suborbital spaceflight vehicles

**Article 5**

*Registration of Vehicle(s) involved in a Suborbital Spaceflight Activity*

(1) A national register must be established (by the appropriate /authorizing State) containing at least the following details:

(a) Envisaged location and date of the initial launch/take-off of the suborbital spaceflight vehicle,
(b) Type and registration number of the suborbital spaceflight vehicle,
(c) General function of the suborbital spaceflight vehicle,
(d) Trajectory and altitude of the suborbital spaceflight activity,
(e) Envisaged location and date of landing.

(2) Aircraft used in the performance of suborbital spaceflight activities must be registered in accordance with the applicable rules of air law.

**Explanatory remarks:** In order to allow for a minimum international standard as to the key registration data and to enhance transparency on the type and general function of the suborbital vehicle as well as on the envisaged location(s), launch/take-off and landing time(s), the duration, altitude and trajectory of the suborbital spaceflight activity or activities, it is required that the State authorizing the activity/the activities establishes and maintains a national registry. It is recommended that such national registries are made publicly accessible as a measure of transparency and confidence-building.

As to the character of authorization, it can be considered that only one license/authorization is issued for the first launch/take-off of the suborbital spaceflight vehicle, and that consequent single launches/take-offs are notified as additional information to the national authorities. An example of state practice in this direction was the US Space Frontier Act submitted to Congress in 2019\(^25\) proposing that for multiple launches by the same operator “at multiple sites” only one license or permit shall be issued.\(^26\) Reference can be made also to the regime in international air law, where


\(^{26}\) Bill S. 919, Section 102, Use of Existing Authorities.
the registration of aircraft is separate from and complemented by less rigid rules on flight plans and other documents relating to a specific flight.

While international coordination is needed, the setting-up of a new international registry specifically for suborbital spaceflight activities and suborbital vehicles needs further discussion. Such an international register could be maintained by the UN (UNOOSA) or ICAO in the future. It should be noted in this regard that space law does not formally require the registration of space objects that are not launched into Earth orbit or beyond (Art. II Registration Convention27).

The existing publicly available UN Register of Objects Launched into Outer Space34 contains information on space objects that is provided by the States (Parties) of registry on the basis of the entries in the respective national registries28 or on the basis of UNGA Resolution 1721. Thus, it can be considered whether and how the UNCOPUOS Member States can, in the future, extend the scope of the UN register to reflect not only information on space objects, but also on also suborbital spaceflight vehicles that they carry on their national registry.

5. Liability and insurance

Article 6

Liability and Insurance

1. Without prejudice to any liability arising under other obligations of international or national law, the authorising state is liable for any damage caused by the suborbital spaceflight vehicle to persons or property [not directly participating in the suborbital spaceflight activity].

2. The term “damage” means loss of life, personal injury or the impairment of health, or loss of or damage to property of states or of persons, natural or juridical, or damage to property of international intergovernmental organisation.

3. The authorising state can have recourse against the suborbital operator under the conditions and within the limits specified by applicable national legislation.

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28 Convention on Registration of Objects Launched into Outer Space, 1023 UNTS 15, adopted on 14 January 1975, entered into force on 15 September 1976, Arts. II and III.
Explanatory remarks:

a) The authorizing State as the liable State

The present article deals with third-party liability for damage caused by suborbital spaceflight vehicles. Suborbital spaceflight activities are ultrahazardous and, through the suborbital spaceflight vehicle, carry a significant damage potential - especially during launch/take-off and re-entry/landing. The compensation for such damages might be in disproportion to the financial possibilities and scope of an insurance of a non-governmental entity so that the interest of the damaged persons would only be safeguarded if a claim for compensation can be addressed against a State. Thus, the victims suffering damage to their property, health or life caused by suborbital spaceflight activities should be able to claim compensation directly from the State that has authorized the suborbital spaceflight activity (see Articles 3 and 4) and not from the (private) suborbital operator. This applies without prejudice to any liability arising under other obligations of international or national law.

b) Liability regardless of the location where the damage occurs

For the types of damages, as defined in para. 2, liability can be invoked irrespective of the location where the damage has occurred. Therefore, this article applies regardless of whether the damage occurred on the surface of the Earth, in airspace or in outer space.

c) Insurance

In the internal relationship between the authorizing State and the suborbital operator, national legislation should require insurance as a requirement for authorization and enable the State to take regress against private entities (see Article 4 (f)).

The specific conditions and requirements for the insurance can be decided at the national level. In terms of the scope of compensation to be carried, States could consider whether a liability cap could be advisable.

For the consideration of specific aspects of liability, be it for third-party liability, be it for contractual liability for suborbital spaceflight activities, the experience of the air and space industry could be relevant.
6. Crew and spaceflight participants

**Article 7**

*Crew of suborbital space vehicles and participants in suborbital spaceflight activities*

The rights and responsibilities of the following persons directly participating in a suborbital spaceflight activity should be regulated by applicable law based on the following roles:

a) A Commander: the person directing the suborbital spaceflight activity on board the suborbital space vehicle,

b) Crew members: persons fulfilling formal and defined tasks on board the suborbital space vehicle under the command of the Commander,

c) Spaceflight participants: persons directly participating in a suborbital spaceflight activity on board the suborbital space vehicle without formal duties apart from following the instructions of the Commander and the crew.

**Explanatory remarks:** Despite its broad colloquial use, no legal definition of the term ‘space tourist’ exists so far. As far as persons on board suborbital spaceflight vehicles are concerned, the differentiation between trained crew and non-trained persons on board may be important in terms of the applicable requirements for their qualification (see Article 4), in order to distinguish them from ‘astronauts’ as per Article V of the Outer Space Treaty\(^\text{29}\) and ‘personnel of a spacecraft’ referred to in the Rescue Agreement\(^\text{30}\), to whom specific rules apply, as well as with regard to insurance in national legislation.\(^\text{31}\)

US national legislation\(^\text{32}\) includes a differentiation between crew members and ‘spaceflight participants’. Thereby, member of the ‘crew’ is “any employee of a licensee or transferee, or of a contractor or subcontractor of a licensee or transferee, who performs activities in the course of that employment directly relating to the launch, reentry, or other operation of or in a launch

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\(^{30}\) Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 672 UNTS 119, adopted on 22 April 1968, entered into force on 3 December 1968.

\(^{31}\) See, for example, Federal Aviation Administration, Guidance in Informing Crew and Space Flight Participants of Risk, Version 1.1., 4 April 2017.

\(^{32}\) 51 US Code, Chapter 509, Commercial Space Launch Activities.
vehicle or reentry vehicle that carries human beings”. Spaceflight participants are defined as individuals who are “not crew, carried aboard a launch vehicle or re-entry vehicle”.

In practice, any private operator would require persons involved in suborbital spaceflight activities to sign a waiver on liability under national laws before they undertake the activities. The extent to which operators can exclude their liability could be specifically regulated on a national level as this is not a matter of international regulation.

For crew members onboard a suborbital vehicle, a “Code of Conduct” can be elaborated, similarly to the rules governing activities of astronauts, which may distinguish between the role of commander and other crew members, to allow for a clear division of tasks, rights and responsibilities in the interest of safety. The experience with the International Space Station Crew Code of Conduct may be of interest here, in particular since the document also distinguishes between astronauts and spaceflight participants.

7. Legal regulation of suborbital facilities

Article 8

Suborbital Facilities

Details concerning ground facilities used for suborbital spaceflight activities (e.g. airports and spaceports) shall be regulated in specific bylaws.

As for the facilities used for suborbital spaceflight activities, air-/spaceports may be used. Details on their establishment and the legal requirements for their use must be considered and could possibly be contained in specific (statutory) legislation.

An example of a more recent draft for national legislation concerning suborbital facilities is the 2019 Regulation on Construction and Operation of Spaceports of the Italian Civil Aviation Authority (ENAC). It was proposed identifying the need for “a strategic infrastructure essential to implement suborbital transportation operations and access to space, in order to ensure a sustainable development of the sector of commercial suborbital flights”. It considers currently only “horizontal spaceports”, i.e. certified aerodromes that “include(s) infrastructures, buildings, equipment, plants and systems which are used to execute the launch, the landing and the related ground and flight operations of a suborbital HOTOL vehicle (horizontal take-off and horizontal

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33 51 US Code, Chapter 509, §50902(2).
34 51 US Code, Chapter 509, §50902(20).
35 Ente Nazionale per L’Aviazione Civile, Regulation on Construction and Operation of Spaceports.
landing), where the launch and landing of which can be, respectively, compared to the horizontal take off and the landing of an aircraft (Horizontal Spaceport)\textsuperscript{36}, but may, in the future, include also spaceports used for VTOL.

\textsuperscript{36} Ibid., p. 2.