Spaceplanes Operating in Airspace

In Search of a Regulatory Regime for Traffic Coordination

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Abstract

"Spaceplane" as a term describes a "hybrid" aerospace vehicle capable of operating both in airspace (as an aircraft) and in outer space (as spacecraft). Either carried to a certain altitude by a "mother ship" or autonomously powered (by rockets), spaceplanes cross the airspace to travel in outer space and, once there, they can be placed into orbit (orbital) or they re-enter the atmosphere and land as normal aircraft (suborbital). In specific, suborbital vessels can be of great importance in scientific missions; however their integration in the air transport of persons and goods is already under preparation. Such a perspective will amount to a breakthrough since a suborbital flight would significantly speed up and shorten transport routes. This dual nature of suborbital spaceplanes (aircraft, spacecraft) brings to the fore interesting legal issues. In this sense, it is a typical example of how a NewSpace activity can challenge the adequacy of the current regulatory framework both in airspace and in outer space. The International Civil Aviation Organization (ICAO) has already shown its concern on the matter, recognizing that "suborbital launches are expected to have an impact on areas of safety and air traffic management for national airspace..." (Doc. LC/36-WP/3-2). Furthermore, it seems that ICAO considers the applicability of its Air Traffic Services (ATS) scheme as self-evident: same document mentions that "should sub-orbital vehicles be considered (primarily) as aircraft, when engaged in international air navigation, consequences will follow under the Chicago Convention...".

On the contrary, in the context of the UN COPUOS Legal Sub-Committee, the topic of suborbital flights is under discussion as part of the more general debate on defining and delimiting outer space, without considerable progress for the time being. The main issue is how suborbital flights can be adequately coordinated with the other users that share the same portion of airspace (national or international). In this context, the key challenge is whether these flights should be entirely regulated by the existing ICAO air traffic management (ATM) system or, on the contrary, by a new, autonomous regulatory regime. A convincing response to this challenge should take into consideration the debate on the identity of said vehicles (Aircraft? Space object? Other?) in order to properly measure the applicability of the pertinent ICAO regulations in force. This paper is focused on how best to address these issues.

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I. Introduction: The Separate World of Spaceplanes and Suborbital Vehicles

The term *spaceplane* describes a "hybrid" aerospace vehicle capable of operating both in airspace (as an aircraft) and in outer space (as spacecraft). Either carried to a certain altitude by a "mother ship" or autonomously powered (by rockets), spaceplanes are able to cross the airspace to travel in outer space and, once there, they can be placed into orbit (orbital) or they re-enter the atmosphere and land as normal aircraft (suborbital).[1] Spaceplanes are also defined as *space-air vehicles* or *aerospace vehicles*.[2] The most successful example of a spaceplane is the Space Shuttle.[3]

Among spaceplanes, specific attention is nowadays drawn to *suborbital flights*. Such flights take place outside the Earth atmosphere and their maximum flight speed is below the orbital velocity needed.[4] According to a definition introduced in 2016 by the Range Safety Group[5] (RSG, in the context of the so-called 'STANDARD 321-16', reflecting a common understanding of the term[6]), suborbital flight is defined as any flight of a launch vehicle, rocket or missile that does not achieve orbital insertion.[7] The term "suborbital" has led

1 https://en.wikipedia.org/wiki/Spaceplane (accessed September 5th, 2017).

2 NASA Dictionary of Technical Terms for Aerospace Use, Source Edition 1965, *in* https://er.jsc.nasa.gov/seh/s.html (accessed September 5th, 2017). The term *aerospace* is in use since 1959 and refers to "space comprising the earth's atmosphere and the space beyond" – https://www.merriam-webster.com/dictionary/aerospace (accessed September 5th, 2017).

3 The X-15, SpaceShipOne, Boeing X-37 as well as the Soviet counterpart of the Space Shuttle, Buran also constitute typical examples of spaceplanes – see https://en.wikipedia.org/wiki/Spaceplane (accessed September 5th, 2017).

4 See www.orbspace.com/Background-Information/Suborbital-vs-Orbital.html; https://en.wikipedia.org/wiki/Sub-orbital_spaceflight (accessed September 5th, 2017). (accessed September 5th, 2017). Said velocity is the one required for a vehicle to stay in orbit and depends on the specific altitude of each orbit – *idem*. See also UN General Assembly, COPUOS, Questions on suborbital flights for scientific missions and/or for human transportation, Note by the Secretariat, International Association for the Advancement of Space Safety, 19 December 2016, Doc. A/AC.105/1039/Add.7, p. 3.

5 The Range Safety Group (RSG) supports, through standardization, development, and continuous improvement, the safe conduct of hazardous operations on the test, training, and operational ranges and related facilities. Hazardous operations include, but are not limited to, ordnance and expendable releases, directed energy and laser operations, missile flight, space launch and reentry, unmanned vehicle operation, gunfire, explosive use, and hazardous emissions – see www.wsmr.army.mil/RCCsite/OrgStruct/StandingGroups/Pages/RSG.aspx (accessed May 13th, 2018).

6 STANDARD 321-16, *Common Risk Criteria Standards for National Test Ranges*, *in* www.dtic.mil/get-tr-doc/pdf?AD=AD1014356 (accessed May 13th, 2018).

7 Doc. A/AC/105/1039/Add.7, *op. cit.;* STANDARD 321-16, *op. cit.*, p. A-6.

to a certain confusion, as "sub" can be interpreted as flight below the orbit level.[8] Thus, said flights (and the corresponding vehicles) have been also defined as *non-orbital*, a term which seems to be more accurate.[9]

Suborbital vessels can be of great importance in scientific missions; however their integration in the air transport of persons and goods is already under preparation (*point-to-point* suborbital spaceflight). Such a perspective will amount to a breakthrough since a suborbital flight would significantly speed up and shorten transport routes.

Technically, suborbital spaceplanes require smaller flight speed than the orbital ones: For instance, during a suborbital flight, the altitude of 100 km (Kármán line level) is reached with a flight speed about 8 times smaller than the required orbital velocity for this altitude (950 m/s instead of 7.780 m/s). It follows that suborbital spaceplanes have the advantage of being smaller than their orbital counterparts, operationally cheaper and, possibly, reusable.[10]

The hybrid nature of spaceplanes – and, in particular, of the suborbital ones – has raised major issues, in both the technical and legal field. Spaceplane operations are closely linked with unresolved, until today, legal issues, as the definition and delimitation of outer space, or with novel, complicated and painstaking questions, as the establishment of a system of Space Traffic Management (STM).[11] Thus it is not surprising that even the definition of "suborbital vehicle" is not yet clear.

In the wider context of suborbital spaceplane operations, this paper focuses on a specific matter: How suborbital spaceplane flights can be adequately coordinated with the other users that share airspace, national or international. The key challenge is whether said flights should be entirely regulated by the existing ICAO Air Traffic Management system (ATM) or, on the contrary, by a new, autonomous regulatory regime. A convincing response to this challenge should take into consideration the debate on the identity of said vehicles

8 F. von der Dunk, with F. Tronchetti (eds.), *Handbook of Space Law*, Edward Elgar, 2015, p. 95.

9 *Idem.*

10 For a brief technical comparison between orbital and suborbital, see www.orbspace.com/Background-Information/Suborbital-vs-Orbital.html (accessed September 5th, 2017).

11 A definition for STM was given in the 2006 "Cosmic Study on Space Traffic Management" by the International Academy of Astronautics (IAA). According to said definition, STM is "the set of technical and regulatory provisions for promoting safe access into outer space, operations in outer space and return from outer space to Earth free from physical or radio-frequency interference" – International Academy of Astronautics (IAA), *Cosmic Study on Space Traffic Management*, edited by: Corinne Contant-Jorgenson, Petr Lála & Kai-Uwe Schrogl, 2006, p. 10 and 17. The same definition is included in the new edition of the IAA Study: *Space Traffic Management – Towards a roadmap for implementation*, edited by Kai-Uwe Schrogl, 2018, p. 16.

(Aircraft? Space object? Other?) in order to properly measure the applicability of the pertinent ICAO regulations in force.

II. Air Traffic Management Provisions and Their Applicability against Spaceplanes

II.1 The ICAO's Air Traffic Management System (ATM)

The International Civil Aviation Organization (ICAO) has shown its concern on the matter in Doc. LC/36-WP/3-2 of 2015, while it recognized that "suborbital launches are expected to have an impact on areas of safety and air traffic management for national airspace...".[12] Furthermore, it seems that ICAO considered the applicability of its Air Traffic Services (ATS) scheme as self-evident: same document mentioned that "should sub-orbital vehicles be considered (primarily) as aircraft, when engaged in international air navigation, *consequences will follow under the Chicago Convention*..." (emphasis added).[13] It follows that, for ICAO, its Air Traffic Management system (ATM) has been considered as applicable against suborbital flights when operating within airspace.

II.1.a The Distinction between National and International Airspace

As described by ICAO, ATM is "the dynamic, integrated management of air traffic and airspace – safely, economically and efficiently – through the provision of facilities and seamless services in collaboration with all parties".[14] Said system is based on a provision of services and constitutes a framework that considers all resources – as, *inter alia*, airspace, aerodromes, aircraft and humans – to be part of the ATM system. The primary functions of the ATM system will enable flight from/to an aerodrome into airspace, safely separated from hazards, within capacity limits, making optimum use of all system resources. The description of the concept components is based on realistic expectations of human capabilities and the ATM infrastructure at any particular time in the evolution to the ATM system described by this operational concept and is independent of reference to any specific technology.[15]

The fundamental distinction in air traffic is between *national airspace* and *international airspace*. National airspace is the one over the territory of a State;

12 See ICAO Doc. LC/36-WP/3-2, Legal Committee – 36th Session (Montréal, 30 November – 3 December 2015), Agenda Item 3: Review of the General Work Programme of the Legal Committee, Commercial Space Flights, 20.10.2015, 2.2.

13 *Idem*, 2.3.

14 ICAO, *Global Air Traffic Management Operational Concept*, ICAO Doc. 9854-AN/458, 1st Edition, 2005, 1.1.3.

15 ICAO Doc. 9854-AN/458, 1.4.

within its limits, the State has complete and exclusive sovereignty.[16] For the purposes of the Chicago Convention, the term "territory" is deemed to be the land areas and the territorial waters adjacent thereto.[17]

Within national airspace, Air Traffic Management is regulated through domestic legal provisions.[18] On the contrary, *over the high seas (international airspace),* freedom of overflight reigns. This regime is explicitly enshrined in Article 87 of the 1982 UN Convention on the Law of the Sea[19] and, *a contrario,* in Articles 1, 2 and 12 of the Chicago Convention.

The 3rd paragraph of Article 12 CC is a key provision for the administration of airspace, as it stipulates that "over the high seas, the rules in force shall be those established under this Convention". Said "rules" are the international standards and the recommended practices (SARPs) embodied in the 19 Annexes to the Chicago Convention.

It is worth mentioning that ICAO's international standards have binding force upon member States: Pursuant Article 38 CC, States must comply with said standards unless they notify their differences to ICAO within 60 days:

> "In the case of amendments to international standards, any State which does not make the appropriate amendments to its own regulations or practices shall give notice to the Council within sixty days of the adoption of the amendment to the international standard, or indicate the action which it proposes to take".

II.1.b The Administration of Global Airspace by ICAO

Global airspace, both national and international, is divided into nine "Air Navigation Regions", each of which is divided into "Flight Information Regions" (FIRs), on the basis of a "Regional Air Navigation Plan" (RAN Plan), agreed by the States of the corresponding Region.[20] Within a FIR, a "competent authority" provides for a) the *flight information service* (giving advice and information useful for the safe and efficient conduct of flights); and b) the *alerting service* (notify appropriate organizations regarding aircraft in need of search and rescue aid). These two services, together with the *air traffic control service,* are known as the *Air Traffic Services* (ATS).[21]

16 Convention on International Civil Aviation, signed at Chicago on December 7th, 1944, in force since April 4th, 1947, 15/U.N.T.S./295 (hereinafter "Chicago Convention" or "CC"), article 1.

17 Chicago Convention, article 2.

18 Chicago Convention, article 11.

19 United Nations Convention on the Law of the Sea, signed at Montego Bay on December 10th, 1982, in force since November 16th, 1994, 1833/U.N.T.S./3.

20 Annex 11 to the Convention on International Civil Aviation, *Air Traffic Services*, 14th Edition, July 2016, 2.1.2.

21 Annex 11, 2.3.

The FIR airspace expands below flight level 195,[22] and, within it, we find other administered airspaces, such as the ATZ (aerodrome Traffic Zone),[23] the CTR (Control Zone),[24] the TMA (Terminal Control Area)[25] or the AWY (Airway).[26] The FIR is an uncontrolled airspace, managed by the FIC (Flight Information Center).

II.1.c The Administration of the Co-Existence of Civil/Military Users: The Civil/Military Coordination Concept

After the tragic accident of the Iran Air Flight 655 shooting down on 3 July 1988, the need to further protect civil aviation against military airspace users came to the fore. In order to strengthen said protection, ICAO developed the concept of civil/military coordination, enshrined in paras. 2.18, 2.19 of Annex 11.[27]

According to para. 2.18, a *first* level of coordination is established, relating to the (simple) co-existence of civil/military users: In the context of this coordination, air traffic services authorities shall establish and maintain close cooperation with military authorities responsible for activities that may affect flights of civil aircraft (Annex 11, 2.18.1); Moreover, arrangements shall be made to permit information relevant to the safe and expeditious conduct of flights of civil aircraft to be promptly exchanged between air traffic services units and appropriate military units (2.18.3).

Further, para. 2.19 initiates a *second*, advanced level of coordination, in case of activities "potentially hazardous to civil aircraft": In principle, the arrangements for activities potentially hazardous to civil aircraft, whether over the territory of a State or over the high seas, shall be coordinated with the appropriate air traffic services authorities. The coordination shall be effected early enough to permit timely promulgation of information regarding the activities in accordance with the provisions of Annex 15[28] (2.19.1). The objective of said coordination shall be to achieve the best arrangements which will avoid hazards to civil aircraft and minimize interference with the normal

22 *Flight level.* A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals – Annex 11, Definitions.

23 *Aerodrome traffic.* All traffic on the manoeuvring area of an aerodrome and all aircraft flying in the vicinity of an aerodrome – Annex 11, Definitions.

24 *Control zone.* A controlled airspace extending upwards from the surface of the earth to a specified upper limit – Annex 11, Definitions.

25 *Terminal control area.* A control area normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes – Annex 11, Definitions.

26 *Airway.* A control area or portion thereof established in the form of a corridor – Annex 11, Definitions.

27 Annex 11 to the Convention on International Civil Aviation, *Air Traffic Services*, *op. cit.*

28 Annex 15 to the Convention on International Civil Aviation, *Aeronautical Information Services*, 15th Edition, July 2016.

operations of such aircraft (2.19.2). The promulgation of information regarding said (hazardous) activities shall be initiated by the appropriate ATS authorities (2.19.3).
It follows from the aforementioned elements that Air Traffic Management is a complex, legal/technical but integrated and highly efficient regime of air traffic administration, established by ICAO and mainly regulated by ICAO's international standards, which have binding force upon States.[29]
As exposed, ATM constitute and integrated traffic management system that, even if it cannot be entirely applied with respect to suborbital spaceplanes operating in airspace, it could be a valuable source of ideas and solutions for a *per se* traffic management of said vehicles. Its main characteristics are the following:

1) Advanced international cooperation;
2) Centralised supervision (ICAO) of a de-centralised TM system (Management of ATS, FIRs by States);
3) Institutionalized exchange of information between users (aircraft) and the competent authorities;
4) Classification of airspaces for the purposes of ATS provision (Annex 11, 2.6);
5) Constant monitoring of civil flights all over the world;
6) Introduction of separation methods;
7) Increased civil/military coordination, based on the timely exchange of information between military and civil users.

II.2 The Administration of Space Flights in Airspace by the F.A.A.

The U.S. *Commercial Space Launch Act* of 1984, as amended and re-codified at 51 U.S.C. 50901 – 50923 (the Act), authorizes the Department of Transportation (DOT) and, through delegations, the Federal Aviation Administration's (F.A.A.) Office of Commercial Space Transportation (AST), to oversee, authorize, and regulate both launches and re-entries of launch and re-entry vehicles, and the operation of launch and re-entry sites when carried out by U.S. citizens or within the United States. The Act also directs the FAA to encourage, facilitate, and promote commercial space launches and re-entries by the private sector, including those involving space flight participants.
With increasing commercial space activities occurring in the National Airspace in the U.S. (NAS), a more efficient management of the NAS with respect to commercial space operations is needed. The current F.A.A. method for administering airspace and outer space activities is through *segregation*: The overall scheme works through the definition of hazard areas around launch and re-entry operations; during launches, sections of airspace are closed to

29 The main ICAO documents on Air Traffic Management are the Annex 2 – Rules of the air, Annex 11 – Air Traffic Services as well as the *Procedures for Air Navigation Services – ATM – Air Traffic Management*, 16th edition, ICAO Doc. 4444, 2016.

other airspace users. The parameters of the airspace finally closed (location, duration, and volume) are defined on the basis of mission objectives and the characteristics of the vehicle.

It is thus clear that, under this traffic management regime, launches and/or re-entries negatively affect other NAS stakeholders, causing delays, changes to airline routes as well as more expenses from additional fuel burn caused by reroutes. Likewise, attempts to minimize these effects could be detrimental to launch and re-entry operators, leading to additional costs in delays and lost opportunities for mission success.[30]

Over time, the FAA *sought to move from segregation to integration*: the main concern was how the current system of pre-emptive airspace restrictions could lead to a system of limited airspace restrictions, increased mission monitoring capabilities, and the ability to effectively respond to contingencies.[31] Along the same path, one of the key strategic initiatives of the Office of Commercial Space Transportation involves further development and refinement of a concept of operations for an *integrated* Space and Air Traffic Management System (SATMS).

SATMS represents "a conceptual 'aerospace' environment in which space and aviation operations are seamless and fully integrated in a modernized, efficient National Airspace System (NAS)".[32] SATMS can help increase space transportation operations while at the same time aviation stakeholders will continue to operate efficiently and thrive. For these reasons, such a system is considered by F.A.A. as highly desirable,[33] as it has also the advantage to increase protection for civil aircraft against space hazards as, for instance, in the case of the Columbia accident.[34]

30 See G. Mazzotta & D.P. Murray, "Improving the Integration of Launch and Reentry Operations into the National Airspace System", November 2015, *in* http:// commons .erau.edu/cgi/viewcontent.cgi?article=1072&context=stm (accessed September 6th, 2017).

31 D.P. Murray, "The FAA's Current Approach to Integrating Commercial Space Operations into the National Airspace System", May 2013, *in* https://www.faa.gov/about/office_org/Fheadquarters_offices/Fast/reports_studies/media/REMAT-Murray-FAA-FINAL.pdf (Accessed September 6th, 2017).

32 See F.A.A., Office of Commercial Space Transportation, *Space and Air Traffic Management System (SATMS)*, *in* https://www.faa.gov/about/office_org/headquarters_offices/ast/about/satms/ (accessed September 6th, 2017).

33 *Idem*.

34 See R.S. Jakhu, T. Sgobba & P.S. Dempsey (eds.), *The Need for an Integrated Regulatory Regime for Aviation and Space – ICAO for Space?*, Springer, 2011, p. 93.

III. The UNCOPUOS Action: In Search of Alternative Regulatory Regimes for Traffic Management in Airspace

III.1 The Unsuccessful Attempt to Clarify the "Possible Legal Issues with Regard to Aerospace Objects"

In 1992, at its thirty-first session of the UNCOPUOS Legal Subcommittee (LSC), the Russian delegation submitted a working paper on the questions concerning the legal regime for aerospace objects.[35] One year later, at the thirty-second session of the LSC, the Chairman of the Working Group on agenda item 4 circulated an informal paper entitled "Draft questionnaire concerning aerospace objects".[36] Finally, in 1994 (33rd Session), the Chairman of that Working Group circulated an informal paper containing an introduction to the draft questionnaire.[37]

At the 34th Session of the Subcommittee (1995), the Working Group finalized the text of the questionnaire on possible legal issues with regard to aerospace objects (in the appendix to annex I of the LSC report). The Subcommittee agreed that the purpose of the questionnaire was to seek the preliminary views of States members of the Committee on the Peaceful Uses of Outer Space on various issues relating to aerospace objects. It was hoped that the replies to the questionnaire would provide a basis for the Legal Subcommittee to decide how it might continue its consideration of the subject. Therefore, the Legal Subcommittee agreed that Committee member States should be invited to give their opinions on those matters.[38]

In 1996, the Legal Subcommittee of the UNCOPUOS prepared the questionnaire "on possible legal issues with regard to aerospace objects". The questionnaire was the following:

Questionnaire on possible legal issues with regard to aerospace objects

Question 1: Can an aerospace object be defined as an object which is capable both of travelling in Outer space and of using its aerodynamic properties to remain in airspace for a certain period of time?

Question 2: Does the regime applicable to the flight of aerospace objects differ according to whether it is located in airspace or Outer space?

Question 3: Are there special procedures for aerospace objects, considering the diversity of their functional characteristics, the aerodynamic properties and space technologies used, and their design features, or should a single or unified regime be developed for such objects?

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35 A/AC. 105/C.2/L.189.

36 A/AC. 105/C2/1993/CRP.1.

37 A/AC.105/573, annex II, para. 14.

38 See UN General Assembly, COPUOS, Report of the Legal Subcommittee on the Work of its 34th Session (27 March-7 April 1995), 19 April 1995, Doc. A/AC.105/607, paras. 38-39.

Question 4: Are aerospace objects while in airspace considered as aircraft, and while in outer space as spacecraft, with all the legal consequences that follow therefrom, or does either air law or space law prevail during the flight of an aerospace craft, depending on the destination of such a flight?
Question 5: Are the take-off and landing phases specially distinguished in the regime for an aerospace object as involving a different degree of regulation from entry into airspace from outer space orbit and subsequent return to that orbit?
Question 6: Are the norms of national and international air law applicable to an aerospace object of one State while it is in the airspace of another State?
Question 7: Are there precedents with respect to the passage of aerospace objects after re-entry into the Earth's atmosphere and does international customary law exist with respect to such passage?
Question 8: Are there any national and/or international legal norms with respect to the passage of space objects after re-entry into the Earth's atmosphere?
Question 9. Are the rules concerning the registration of objects launched into outer space applicable to aerospace objects?[39]

On the basis of member States' reaction to the questionnaire, the LSC Secretariat prepared the document "Questionnaire on possible legal issues with regard to aerospace objects: replies from Member States" (A/AC.105/635 and Adds. 1, 2 and 3) which contained 14 substantive and one general responses. Based on these responses, the Secretariat prepared, in the thirty-sixth session of the Legal Subcommittee, a comprehensive analysis of the replies that had been received to the questionnaire by 31 January 1997.[40]
According to said analysis, the aerospace objects present the following common elements:

a) Ability to fly in airspace;
b) Ability to travel in outer space;
c) Performing a space activity or mission;
d) Design characteristics permitting a landing on Earth after re-entry into Earth's atmosphere, like an airplane.[41]

Further, it appeared that the opinions of States on the matter (legal issues with respect to aerospace objects) converged very rarely:

39 Doc. A/AC.105/607, *op. cit.*
40 UN General Assembly, COPUOS, Legal Subcommittee, 36th Session, Vienna, 1-18 April 1997, Comprehensive Analysis of the Replies to the Questionnaire on possible issues with regard to aerospace objects, Doc. A/AC/105/C.2/L.204, 18 February 1997, paras. 3-7.
41 Doc. A/AC/105/C.2/L.204, *op. cit.*, para. 16.

With respect to the regime applicable to aerospace flights, the issue of the compatibility of air and space law was brought about (question 2);[42] in so far as this question was left open, it was not clear whether a single or unified regime, for airspace and outer space, should prevail (question 3).[43] In this respect, it should be noted that, although some States considered that air-traffic rules should not govern the aerospace vehicles when in airspace, they nevertheless agreed that, for purposes of safety and air navigation, national and international air-traffic rules should be followed (question 4).[44] The issue of the distinction between take-off and landing, on the one hand, and entry into airspace from outer space orbit and return to it, on the other hand, was similarly left open, while concerns on safety, national security and sovereignty were raised by some States (question 5).[45] The applicability of international and national air law in aerospace situations was neither evident: different responses were provided by the respondent States, merely influenced by their adherence to the spatial or the functional approach with respect to the delimitation of outer space. However, (again) some States advocated the application of ICAO standards in such situations (question 6).[46] Regarding the passage of aerospace objects after re-entry, diverse views were also expressed (question 7),[47] but it seemed that the majority of States agreed that some, international or national, norms could govern said passage (question 8).[48] Last but not least, the respondent States did not agree on the applicability of the Registration Convention to the aerospace objects, as some of them were in favour either of a double registration (as an aircraft *and* as a spacecraft) or of a single unified regime, if and when elaborated (question 9).[49]

Thus, although the issues with respect to the regulation of aerospace objects were left undefined, it was clear that air regulations, even if it is not desirable to apply them literally, cannot be easily circumvented.

III.2 The Contemporary Attempt to Regulate the Suborbital Flights

At present, the LSC is again working with questions similar to those set for the aerospace objects, twenty years ago, with respect to the issue of suborbital flights.

At the 55th session of the LSC (2016), the Working Group on the Definition and Delimitation of Outer Space agreed to continue to invite States Members of the United Nations and permanent observers of the Committee to

42 *Idem*, para. 26.
43 *Idem*, para. 37.
44 *Idem*, para. 43.
45 *Idem*, para. 50.
46 *Idem*, para. 58.
47 *Idem*, para. 64.
48 *Idem*, para. 71.
49 *Idem*, para. 79.

provide their replies to the following questions (A/AC.105/1113, annex II, para. 20 (c)):

a) Is there a relationship between suborbital flights for scientific missions and/or for human transportation and the definition and delimitation of outer space?
b) Will the legal definition of suborbital flights for scientific missions and/or for human transportation be practically useful for States and other actors with regard to space activities?
c) How could suborbital flights for scientific missions and/or for human transportation be defined?
d) Which legislation applies or could be applied to suborbital flights for scientific missions and/or for human transportation?
e) How will the legal definition of suborbital flights for scientific missions and/or for human transportation impact the progressive development of space law?
f) Please propose other questions to be considered in the framework of the legal definition of suborbital flights for scientific missions and/or for human transportation;[50]

Further, during the works of the 56th Session of the Legal Subcommittee (2017), the following views were expressed by the member States with respect to suborbital flights:

A delegation expressed the view that the functional approach was fully consistent with the Registration Convention, the Outer Space Treaty and the Liability Convention, as their provisions did not include the criterion of altitude. That delegation was also of the view that altitude should not be a determining criterion for determining whether an activity was an outer space activity; rather, that should be determined a priori according to the function of the space object and the purpose of the activity. Therefore, it would be appropriate that the legal framework applied to suborbital flights be determined not by the criterion of altitude but according to the characteristics of the activity and the legal issues arising from it.

According to another view, it was important to be aware that some experts promoted the establishment of a special area or stratum between outer space and air space, in the interest of creating a separate legal regime for suborbital flights, which would exclude the application of international space law to nuclear weapons and weapons of mass destruction, and that therefore such attempts and proposals should be vigorously opposed and rejected.

Finally a third view was expressed that the delimitation of outer space was closely connected with the management of space activities and that it was

50 UN General Assembly, COPUOS, Report of the Legal Subcommittee on its fifty-sixth session, held in Vienna from 27 March to 7 April 2017, 18 April 2017, Doc. A/AC.105/1122.

important to concentrate on relevant matters that needed a practical solution, such as suborbital flights and launches from flying objects. The delegation expressing that view was also of the view that it was necessary to foresee hazardous circumstances arising from aerospace activities and legislate them, and to attempt to develop norms, bearing in mind various scenarios relating to the development of space technology and activities.[51]

It follows from the above (questionnaire and States' views) that: a) the definition of suborbital flights is still a pending matter; b) Said definition is dependent on the issue of definition and delimitation of outer space; c) the determination of the legal regime applicable to the suborbital flights is still in the dark; d) (consequently,) space law cannot yet provide an adequate response to the issue of suborbital flights operating in airspace as well as the effective coordination of these flights with the "traditional" air users (aircraft).

III. Conclusions

The underlying considerations with respect to the wider framework of the subject matter were eloquently expressed as follows: "Both the existing regimes of air law and of space law were developed at a time when the technology for Earth-to-Earth aerospace movements did not yet exist. Thus, there is not yet a unified or integrated regime of aerospace law, and there appears to be much overlap and inconsistency between the regimes of air law and space law. *At the outset, one must determine which regime applies – air law, space law, or in some instances, both – and then identify the governing rules.* The international legal regime governing air transport on issues such as liability, security, navigation and air traffic management are well developed, and set forth in various conventions, treaties and various "soft law" standards. Five multilateral space law instruments also define legal rights and duties of space objects and launching States. *Yet it is unclear whether space vehicles fall under established principles of air law, and if they do, whether these laws follow them into space* (emphasis added). Moreover, it is unclear where the legal limits of air space expire, and the regime of outer space begins, and vice versa".[52]

The established ICAO mechanism for ATM, mainly based on the concept of FIRs and an advance civil/military coordination scheme, can serve as a model for an efficient STM related to the movement of spaceplanes (or of suborbital flights, which constitute their modern *alter ego*) in airspace. What is more, launch and re-entry phases of space operations essentially share airspace with the "air" users. Current segregation can change to an integration of the relevant services than can be mutually beneficial. The FAA's integrated Space

51 Doc. A/AC.105/1122, *op. cit.*, paras. 93, 95, 97.

52 R.S. Jakhu, T. Sgobba & P.S. Dempsey (eds.), *The Need for an Integrated Regulatory Regime for Aviation and Space: ICAO for Space?,* Springer, 2011, p. 49 – cited also in Doc. A/AC/105/1039/Add.7, *op. cit.*

and Air Traffic Management System (SATMS) scheme can be a paradigm of the shape of things to come.

Alternative solutions for said traffic management have been discussed in international *fora* (mainly in the context of the Legal Subcommittee of the UNCOPUOS). Apparently space law is seeking its autonomy and a separate traffic management system for vehicles such as the spaceplanes would decisively contributed to it. However, there is no visible prospect of any effective solutions, which, in any case, should take into account the existing airspace traffic regime, which has long been established and has proven the long-term efficiency of its services.