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English only

**Committee on the Peaceful
Uses of Outer Space**
Legal Subcommittee
Forty-ninth session
22 March-1 April 2010

**Concept of Suborbital Flights:
Information from the International Civil Aviation
Organization (ICAO)**

1. At its forty-eighth session, in 2009, the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space continued its consideration of a regular item “Matters relating to the definition and delimitation of outer space and the character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the International Telecommunication Union” and requested the International Civil Aviation Organization (ICAO) secretariat to make, at the forty-ninth session of the Subcommittee, in 2010, a comprehensive presentation on current and foreseeable civil aviation operation, with particular emphasis on the upper limit of those operations (para. 71, A/AC.105/935).
2. In its letter dated 17 March 2010 the ICAO secretariat informed that it is aware of the fact that commercial suborbital operations are being planned by various entities and expect that such operations would affect international civil aviation in some manner. In the mean time, ICAO secretariat believed that the information contained in its study on the Concept of suborbital flights (C-WP/12436 of 2005) remains pertinent and therefore the Legal Subcommittee could consider the study.
3. The present conference room paper contains the ICAO secretariat study on the Concept of suborbital flights (C-WP/12436), prepared and presented to the ICAO Council in 2005, which took note of it and requested the ICAO secretariat to further monitor the matter.

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WORKING PAPER

COUNCIL – 175TH SESSION

Subject No. 16: Legal work of the Organization

Subject No. 14.3.13: Operations

CONCEPT OF SUB-ORBITAL FLIGHTS

(Presented by the Secretary General)

SUMMARY

In accordance with C-DEC 174/13, this paper considers the concept of sub-orbital flights in relation to the Chicago Convention.

Action by the Council is in paragraph 7.

REFERENCES

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| * C-DEC 174/13 | <i>Convention on International Liability for Damage Caused by Space Objects (29 March 1972)</i> |
| <i>Convention on International Civil Aviation (Doc 7300)</i> | <i>Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space (22 April 1968)</i> |
| <i>Annex 7 - Aircraft Nationality and Registration Marks</i> | <i>Treaty on Principles Governing Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies (27 January 1967)</i> |
| <i>Resolution A35-14, Appendix G (Assembly Resolutions in Force as of 8 October 2004) (Doc 9848)</i> | |
| <i>Convention on Registration of Objects Launched into Outer Space (14 January 1975)</i> | |

This working paper relates to Strategic Objectives A1 and F1.

* Principal reference

1. INTRODUCTION

1.1 The Council, during the thirteenth meeting of its 174th Session, approved the inclusion of the item “Concept of sub-orbital flights” in the work programme for the 175th Session (C-DEC 174/13). In view of the emerging involvement of the commercial sector in this field, potentially involving passengers, it was decided that the Council would exchange views on whether such flights would fall within the scope of the *Convention on International Civil Aviation* (Chicago, 1944) and therefore within ICAO’s mandate.

1.2 A sub-orbital flight is a flight up to a very high altitude which does not involve sending the vehicle into orbit. It should be noted that ‘sub-orbital trajectory’ is defined in the legislation of the United States as (49 U.S.C. § 70102 (20) (2004)) : “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.”

1.3 In 2004, SpaceShipOne was the first private vehicle to complete two sub-orbital flights within two weeks carrying weight equivalent to three human adults up to about 62.5 miles (100 km) to win the Ansari X Prize. It was carried during one hour by an aeroplane up to nearly 50 000 feet (9.5 miles) from where it was released into a glide and then propelled vertically for 80 seconds by a rocket motor to an altitude of more than 62 miles at apogee, reaching a speed over Mach 3. Then falling back to return to earth, it re-entered the atmosphere and glided during 15 to 20 minutes before landing back on the runway of departure.

1.4 Plans have been announced by Virgin Galactic for the development of a fleet of five sub-orbital vehicles to carry paying passengers, six per vehicle; it plans that the first of these will be ready for commercial operations in 2008 at the earliest. There are indications that at least one other company is planning to offer rival sub-orbital flights.

1.5 Given these developments, it may be considered to which extent sub-orbital flights performed with such vehicles would constitute international civil aviation and thus falling within the scope of the Chicago Convention.

2. AIRCRAFT

2.1 In Chapter 1 of Annex 7 – *Aircraft Nationality and Registration Marks*, to the Convention, the term “aircraft” was redefined in 1967 as follows: “**Aircraft.** 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.” This revised definition, adopted through Amendment 2 to Annex 7, was aimed at excluding all air cushion type vehicles (ACVs). Moreover, the definition of “aeroplane” reads: “**Aeroplane.** A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.”

2.2 SpaceShipOne, strictly speaking, does not operate as an aeroplane or even as an aircraft during the ballistic portion of the flight while it is not supported by the reactions of the air, even though some degree of aerodynamic control exists throughout the trajectory from launch altitude until the craft enters the upper reaches of the atmosphere where the air density is no longer sufficient for aerodynamic flight. After apogee, during re-entry into the atmosphere the vehicle transitions to unpowered aerodynamic (gliding) flight for the return to earth. Consequently, depending upon some design and operational aspects, it could be considered operating as an aircraft in flight during this latter portion of the journey.

2.3 Therefore, such vehicles could fulfil the principal elements in the definition of aircraft and be used as such during a portion of their flights, but they offer some characteristics of a rocket as well. It is likely that other vehicles engaged in the future in such sub-orbital flights would similarly be of a hybrid nature, taking into account that developments to come may lead to a range of designs, some of which could be more clearly classified as aircraft. Should sub-orbital vehicles be considered (primarily) as aircraft, when engaged in international air navigation, consequences would follow under the Chicago Convention, mainly in terms of registration, airworthiness certification, pilot licensing and operational requirements (unless they are otherwise classified as State aircraft under Article 3 of the Convention).

3. SPACE OBJECT

3.1 Neither the *Convention on International Liability for Damage Caused by Space Objects* (29 March 1972, hereinafter “the Liability Convention”) nor the *Convention on Registration of Objects Launched into Outer Space* (14 January 1975, hereinafter “the Registration Convention”) offer a definition of ‘space object’ but they stipulate that a space object includes its component parts as well as the launch vehicle and parts thereof (Art. I (d) and Art. I (b), respectively).

3.2 It is specified in the Registration Convention that a space object is to be registered by the launching State and that the Secretary-General of the United Nations will be duly informed thereon with a view to keeping an international register where pertinent information would be recorded (Art. II and Art. III refer). Beyond registration, international space law does not regulate the requirements for the certification of space objects and the licensing of their personnel (even if astronauts are addressed in the *Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space* (22 April 1968)). However, the *Treaty on Principles Governing Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies* (27 January 1967, hereinafter “the Outer Space Treaty”) stipulates, *inter alia*, in Article VI that “[t]he activities of non-governmental entities in outer space (...) shall require authorization and continuing supervision by the appropriate State Party to the Treaty.”

3.3 SpaceShipOne has been granted a launch license by the Office of Commercial Space Transportation (AST) of the U.S. Federal Aviation Administration (FAA) as a “Reusable Launch Vehicle” (RLV), classified as a rocket. It nevertheless appears from the UN Register of Space Objects that SpaceShipOne has not been registered as a space object (see the website of the United Nations Office for Outer Space Affairs (OOSA) at www.oosa.unvienna.org/SORegister/regist.html). One of the reasons for this might be that the Registration Convention applies only to space objects “launched into earth orbit or beyond” (Art. II), i.e. not to objects performing sub-orbital flights *per se*.

4. AIRSPACE AND OUTER SPACE

4.1 Pursuant to Article 1 of the Chicago Convention, “[t]he contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory”. Pursuant to Article II of the Outer Space Treaty, “Outer Space (...) is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.” This Treaty also provides that the registering State will retain under its jurisdiction and control the space object launched into outer space and the personnel thereof while in the outer space or on a celestial body (Art. VIII). Moreover, the Liability Convention stipulates in Article II that “[a] launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft in flight.” There is no indication in those instruments on any vertical limit of the airspace, from where outer space would begin.

4.2 The United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), which is the UN forum where technical and legal aspects of space activities with global impact are considered, has discussed the issue of the definition and delimitation of outer space from 1962 and no definite conclusion was reached so far in this regard. In this connection, it is of interest to note that the Legal Subcommittee of UNCOPUOS, through its Working Group on Matters Relating to the Definition and Delimitation of Outer Space, has been considering possible legal issues with regard to aerospace objects. A questionnaire thereon has been circulated to all U.N. Member States. A compilation of the replies received so far and an analytical summary of such replies, as well as a historical summary on the consideration of the question on the definition and delimitation of outer space, may be found on the OOSA website (www.oosa.unvienna.org/aero/index.html).

4.3 As debated for decades in the framework of UNCOPUOS, it may be questioned whether the vertical limit of airspace would be critical to determine the scope of applicability of air law as opposed to international space law conventions (spatialist approach), or whether the type of activities at issue would determine which law should apply (functionalist approach). The latter school of thought submits that flights which would be passing merely in transit through (sub)orbital space in the course of an earth-to-earth transportation would remain subject to air law.

5. INTERNATIONAL NAVIGATION

5.1 Part I of the Chicago Convention addresses aircraft engaged in international air navigation and Part III deals with international air transport. In this latter respect, Article 96 b) in Part IV defines “international air service” as “an air service which passes through the air space over the territory of more than one State”. These elements define the scope of the mandate and competence given to ICAO.

5.2 While certain commercial vehicles might in the future fly from one State to another and transit through sub-orbital space, current endeavours aim at carrying passengers from and to the same location. However, ascending and descending phases might involve in certain cases the crossing of more than one national airspace. Sub-orbital vehicles considered as civil aircraft crossing foreign airspaces could then be treated as engaging in international air navigation. On the other hand, it should be noted that space objects might in fact benefit from a right of innocent passage when crossing the airspace of foreign States upon launch or landing, although the matter is not clear. Bilateral agreements are also an option in this regard.

5.3 As regards any applicability of international air law to sub-orbital flights, pertinent Annexes to the Chicago Convention contain associated communication, navigation, surveillance, licensing, operation and airworthiness issues, among others, that would be amenable to their regulation. However, ICAO Annexes currently lack technical requirements in this area. Should it be determined that such flights should be governed by international air law, Assembly Resolution A35-14, Appendix G nevertheless acknowledges that for certain categories of aircraft or classes of airmen, it may be many years before SARPs come into force or that it may be found most practicable not to adopt SARPs. Accordingly, Resolving Clause 2 stipulates that “certificates and licences issued or rendered valid, under national regulations, by the Contracting State in which the aircraft is registered shall be recognized by the other Contracting States for the purpose of flight over their territories, including landings and take-offs.”

5.4 The U.S. Commercial Space Launch Amendment Act of 2004 (CSLAA) was enacted on 23 December 2004. This legislation entrusts to the Department of Transportation (DOT) and the FAA the responsibility for regulating the safety of the crew and “space flight participants” for commercial human space flights. Concerning safety, the CSLAA is based on principles of informed consent and voluntary assumption of risk by space flight participants. Consequently, the FAA issued in February 2005 *Draft Guidelines for Commercial Suborbital Reusable Launch Vehicle Operations with Flight Crew* and *Draft Guidelines for Commercial Suborbital Reusable Launch Vehicle Operations with Space Flight Participants* (see <http://ast.faa.gov/>). While it is recommended that the pilot hold an FAA pilot certificate and the flight crew an FAA second class medical certificate, sub-orbital RLVs are to be considered as “suborbital rockets”, namely, “[a] vehicle, rocket-propelled in whole or in part, intended for flight on a sub-orbital trajectory, and the thrust of which is greater than its lift for the majority of the rocket-powered portion of its ascent” (49 U.S.C. § 70102 (19) (2004)).

6. CONCLUSIONS

6.1 Vehicles which would effect earth-to-earth connections through sub-orbital space could incorporate the constitutive elements of aircraft and fly as such at least during descending phase while gliding. However, rocket-propelled vehicles could be considered as not falling under the classification of aircraft. At this stage, one State seems to prefer to classify such vehicles as rockets.

6.2 From a spatialist viewpoint, there is no clear indication in international law on the delimitation between airspace and outer space which would permit to conclude on the applicability of either air law or space law to sub-orbital flights. On the other hand, it might be argued from a functionalist viewpoint that air law would prevail since airspace would be the main centre of activities of sub-orbital vehicles in the course of an earth-to-earth transportation, any crossing of outer space being brief and only incidental to the flight. The United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), and more particularly its Legal Subcommittee, is considering the question of possible legal issues with regard to aerospace objects but no final conclusion has been reached yet.

6.3 The Chicago Convention applies to international air navigation but current commercial activities envisage sub-orbital flights departing from and landing at the same place, which may not entail the crossing of foreign airspaces. Should, however foreign airspace(s) be traversed, and should it be eventually determined that sub-orbital flights would be subject to international air law, pertinent Annexes to the Chicago Convention would in principle be amenable to their regulation.

7. ACTION BY THE COUNCIL

7.1 The Council is invited to:

- a) note this paper; and
- b) take any action it deems appropriate.