INNER SPACE: ICAO’S NEW FRONTIER

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I. INTRODUCTION

FOR MANY YEARS, the legal separation between air and space has been a source of discussion. The subject has preoccupied the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) for nearly half a century, but until recently, the discussion has been largely without practical im-

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portance because virtually all human-made objects were clearly either aircraft or spacecraft, and thus the need to define the border was minimal.

However, in 2004, when the first suborbital aerospace transportation vehicle (SATV) won the ten-million-dollar Ansari X-prize, the publicity sparked the growth of various private spaceflight companies, including Virgin Galactic. Although none of these companies has yet to carry paying passengers into space, many believe the date of such an accomplishment is close at hand. Thus, it will be important to provide the necessary legal infrastructure to support such activities, and such an endeavor requires clarity about the distinction between air and space and the potentially competing jurisdictions of the International Civil Aviation Organization (ICAO) and UNCPUS.

Ironically, the creation of such legal infrastructure has been frustrated by the fact that such a development is not necessary in the United States, where many of the private spaceflight companies are based. This is because to the extent that a SATV is launched from and returns to U.S. territory, the flight has occurred entirely over the territory of a single state and is thus governed by domestic law rather than by treaty law, in which case any distinction between airspace and outer space is largely academic. Indeed, on September 26, 2013, the U.S. Federal Aviation Administration (FAA) applied 51 U.S.C. § 509 to address issues related to a vehicle that was "built to operate in outer space" but would only reach an altitude of 30,000 kilometers (98,425 feet) and that would not overfly foreign territory. A

3 See id.
4 Thus, a SATV could be launched from Florida and land in California. Even if the craft crashed and were considered a space object, domestic law would apply with respect to liability. See Convention on International Liability for Damage Caused by Space Objects art. VII, Mar. 29, 1972, 24 U.S.T. 2389 [hereinafter Liability Convention].
similar legal approach may be applied to spaceports in Sweden and Abu Dhabi, where “up and down” SATV domestic flights are planned and local authorities will simply adopt U.S. regulations.  

However, when announcing the Abu Dhabi site, Virgin Galactic CEO George Whitesides spoke of space flights between Abu Dhabi and Spaceport America in New Mexico. Such a flight would be international in nature because the point of departure and the point of arrival would be in the territories of two different contracting parties to the Convention on International Civil Aviation (Chicago Convention).

Thus, while it is true that domestic law is probably sufficient to cover “up and down” SATV flights, international carriage by SATV will require legal infrastructure, and such a requirement will likely be necessary within the next decade. Unless states begin to consider this issue, it is not inconceivable that such a lack of action could become an impediment to intercontinental flights by SATVs.

Given UNCOPUOS’s half-century inability to set the boundary between air and space, ICAO could simply define the upper limit of airspace, leaving inter-planetary and outer-space activ-
ties to UNCOPUOS. Further, as both UNCOPUOS and ICAO are United Nations (U.N.) bodies, perhaps the U.N. General Assembly would be the appropriate body to mediate disputes between them.

This article proposes to give jurisdiction over SATVs to ICAO for safety, air traffic control (ATC), and private law reasons, and also because the design of ICAO as an institution gives it the ability to regulate SATV activities in ways that UNCOPUOS cannot.

II. ICAO

A. The Mandate

ICAO’s mandate is contained in the Preamble to the Chicago Convention. It states, “[I]nternational civil aviation may be developed in a safe and orderly manner and . . . international air transport services may be established on the basis of equality of opportunity and operated soundly and economically.”

The preamble clearly focuses on aviation and air transport. Indeed, despite the existence of Jules Verne’s novel De la Terre à la Lune, Hermann Oberth’s book Die Rakete zu den Planetenräumen, and Wernher von Braun’s V-2 rocket, it does not appear that space flight was discussed during negotiations. Indeed, the Chicago Convention, born in the aftermath of the greatest war yet known, focused on the peaceful development of civil aviation rather than on the technology that facilitates it.
Thus, in the absence of a precise definition of "international air transport services," the Chicago Convention could possibly apply to an intercontinental or international voyage by a SATV.

B. THE EVOLUTION OF TECHNOLOGY AND THE NEED FOR FLEXIBILITY

The Chicago Convention was negotiated at a conference in Chicago in November 1944, just five years after the Heinkel He 178 turbojet made a six-minute flight testing the viability of jet flight. At the time, a common aircraft on intercontinental routes was Pan Am’s China Clipper, a Martin M-130 flying boat with a service ceiling of 10,000 feet (3,050 meters) and a cruising speed of 130 miles per hour (209 kilometers per hour).

However, a military transport considered "the last word in transport aircraft design" was about to revolutionize air travel. The Lockheed Constellation made its first flight in 1943 and could boast a service ceiling of 23,000 feet (7,015 meters) and a cruising speed of 331 miles per hour (503 kilometers per hour). In a matter of a few short years, aircraft cruising speed and service ceiling had doubled, serving as a harbinger of future developments, yet the focus of the delegates at the Chicago Convention was not the impressive pace of technology but rather the need to agree on how to deal with air traffic rights.

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19 See ICAO, History: Foundation of the International Civil Aviation Organization (ICAO), ICAO, http://paris.icao.int/history/history_1944.htm (last visited May 21, 2014). The conference was attended by fifty-four nations. Id.

20 Cyrus B. Meher-Homji & Erik Prisell, Pioneering Turbojet Developments of Dr. Hans Von Ohain—From the HeS 1 to the HeS 011, 122 J. ENGINEERING GAS TURBINES & POWER 191 (2000).


24 See ICAO, History: Foundation of the International Civil Aviation Organization (ICAO), supra note 19. For a fascinating look into the politics of the Chicago Convention, see Ladd Smith, supra note 22, at 163–204.
As a result, although the word "aircraft" appears 113 times in the Chicago Convention, the term is not defined. Indeed, the initial definition was located in Annex H and borrowed very heavily from the definition in Annex A of the Convention Relating to the Regulation of Aerial Navigation (Paris Convention): "[a]ny machine that can derive support in the atmosphere from the reactions of the air."

The Annexes are considered a part of the Chicago Convention and enjoy the same legal validity, but states may deviate from these Standards and Recommended Practices (SARPs) by notifying ICAO: "The special legal nature of the annexes is merely a consequence of the flexibility which the Conference wanted to confer upon to the Council, in order to enable the system of Annexes to keep pace with the development of international civil aviation . . . ."

Thus, ICAO may, through a majority vote, amend the Annexes. In 1967, faced with the realization that the definition of "aircraft" could encompass "hovercraft," ICAO amended the

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25 See Chicago Convention, supra note 9. Indeed, it is mentioned in thirty-seven of the Convention's ninety-six articles: 3, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 39, 40, 41, 44, 77 and 96. Id.


29 ICAO, AIRCRAFT NATIONALITY AND REGISTRATION MARKS, ANNEX 7 TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION (6th ed. 2012) [hereinafter Chicago Convention Annex 7].

30 See Chicago Convention, supra note 9, art. 37.

31 Id. art. 38.

32 Sigmar Stadlmeier, INTERNATIONAL COMMERCIAL AVIATION: FROM FOREIGN POLICY TO TRADE IN SERVICES 134 (Marietta Benkó ed. 1998).

33 Chicago Convention, supra note 9, art. 94. It is worth noting that as late as 1962, the Soviet Union was not a party to the Chicago Convention. See Oliver J. Lisztzy, Some Legal Implications of the U-2 and RB-47 Incidents, 56 Am. J. Int'l L. 155, 196 (1962).

34 Chicago Convention, supra note 9, arts. 52, 54(l).
definition of aircraft to exclude hovercraft. "Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the [E]arth's surface."

Just as this definition was updated in 1967, it could easily be updated again, if required. Already it has been broad enough to include both the Martin M-130 and the BAC Concorde, which had a service ceiling of 60,000 feet (18,300 meters) and a cruise speed of 1,350 miles per hour (2,160 kilometers per hour), or roughly six times the service ceiling and ten times the cruising speed of the Martin M-130.

Indeed, the difference between the 1930s flying boats and the 1969 Concorde is similar to that between the Concorde and SpaceShipTwo. The latter has a service ceiling of 360,000 feet (109,800 meters) and a speed of 2,500 miles per hour (4,000 kilometers per hour), which means it can fly six times as high and twice as fast as the former. Thus, given that both suborbital and orbital aerospace planes generate aerodynamic lift during the atmospheric part of their flight profile, they can be considered "aircraft."

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35 See Chicago Convention Annex 7, supra note 29, at ix, tbl. A.
36 Id. at 1.
38 LOIS FRIEDLAND ET AL., FROMMER'S 500 ADRENALINE ADVENTURES 4 (Cate Cattell & Jennifer Polland eds., 2010).
Indeed, "[suborbital] aeroplanes, deriving support from the atmosphere for the largest part of their flight, are considered as aircraft by the [European Aviation Safety Agency]."41 Further, even if these aircraft could not easily fit into the ICAO definition of aircraft, as explained above, ICAO can easily amend this definition to include new technology.

III. SPACE: THE LAST FRONTIER

A. MILITARY AND STRATEGIC OBJECTIVES

The space race began in earnest with the successful Soviet launch of Sputnik on October 4, 1957.42 Within a week, U.S. authorities had approved an orbital weapons system,43 and the Soviets were preparing to launch a dog into space.44 By the time the U.N. General Assembly had approved the creation of the UNCPUOS,45 the United States had created the National Aeronautics and Space Agency (NASA),46 and the United States and the Soviet Union had each launched four space objects, including three focused on lunar exploration.47 Moreover, most, if not all, of the early space objects were launched by modified intercontinental ballistic missiles (ICBMs),48 which only served to confirm the military importance of some of the missions.49


44 Id. at 171–74; see also Charles R. Doarn et al., Evolution of Telemedicine in Russia: The Influence of the Space Program on Modern Telemedicine Programs, 9 TELEMEDICINE & E-HEALTH 103 (2003).

45 See United Nations Committee on the Peaceful Uses of Outer Space, U.N. OFF. FOR OUTER SPACE AFF., http://www.oosa.unvienna.org/oosa/COPUOS/copuos.html (last visited May 21, 2014). UNCPUOS was created by U.N. General Assembly Resolution 1472 (XIV), which was adopted on December 12, 1959. Id.

46 See Garber, supra note 42.

47 The space objects were Explorer 1, Vanguard 1, Pioneer 1, Pioneer 4, Sputnik 3, Luna 1, Luna 2, and Luna 3. Race to the Moon; Timeline: The Space Race, PBS (Oct. 6, 2005), http://www.pbs.org/wgbh/amex/moon/timeline/index.html. The Lunas conducted Soviet research into a prospective moon landing. Id.


49 See id. While it is true that President Eisenhower discouraged the use of ICBMs as launch vehicles for non-military payloads, his decision might have been
Indeed, the military quickly saw two important aspects of the space race: the strategic value of a high-capacity reliable launch vehicle and the need for powerful military navigation and observation satellites, a requirement that became increasingly important after the Gary Powers incident.

It is thus not surprising that foreign astronauts carried on U.S. spacecraft were from "friendly countries," the same was true of foreign cosmonauts carried on Soviet spacecraft. Given the profile associated with space activities, France, Japan, and China had all launched satellites before the end of 1970.

India launched its first satellite, Aryabhatta, "in April 1975 using a Soviet Intercosmos rocket," and five years later launched a second satellite, the thirty-five-kilogram Rohini satellite (RS-1), in a near-Earth orbit using an Indian solid-fuel rocket SLV-3. Thus, in July 1980, India became the seventh country in the world (after the United States, USSR, Britain, Japan, France, and China) capable of independently fabricating rockets that could inject satellites into space.

Yet by 1993, only the United States, the Commonwealth of Independent States, the European Space Agency (ESA), China,
and Japan had existing space launch programs or were well on their way to such objectives, and in virtually every case the space agencies had strong legal or financial ties to national governments. Further, in many cases, entities became involved in space activities so as not to be left behind: "One of the main reasons behind the European decision was the awareness of its position between the super powers of the world, and the fact that other countries such as Japan, China and Canada had taken up (or were about to take up) space technology.”

B. OUTER SPACE

While the military connection to space cannot be ignored, there was also a decidedly scientific component to space initiatives such as the Hubble Telescope, the proposed James Webb Space Telescope, the Voyager Mission, and the exploration of Mars.

Each of these involved outer space and celestial bodies, far beyond the Earth’s gravitational pull, and going boldly "where no man has gone before.” Thus, while President Kennedy urged a lunar conquest and Wernher von Braun called for a manned

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59 Schwarz, supra note 50, at 210.
60 For a look at some of the science involved here, see, for example, John N. Bahcall et al., Hubble Space Telescope Images of a Sample of 20 Nearby Luminous Quasars, 479 Astrophysical J. 642 (1997).
mission to Mars, both of them were exhorting inter-planetary travel.

In this spirit, it is clearly unacceptable that interplanetary voyages should be bogged down by such mundane concerns as national sovereignty over airspace; thus, it is fortunate that UNCOPUOS members have agreed that if a space object is launched into outer space for peaceful purposes, the permissions of countries that are overflown during the launch do not have to be obtained. Any other solution would give neighboring states a potential veto over space exploration, which is clearly unacceptable.

Further, the fact that over the past fifty years the UNCOPUOS has been unable to agree on a definition and delimitation of outer space is not necessarily a serious problem. The challenge may be similar to the one that faced former U.S. Supreme Court Justice Potter Stewart, who was unable to define hard-core pornography but knew it when he saw it.

Rather than trying to define where grey becomes black, perhaps it is enough that the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty) specifically includes the Moon as being in "outer space."

Thus, there can be no doubt that UNCOPUOS has jurisdiction over outer space and that, to the extent that peaceful missions to outer space might transit the sovereign airspace of various states while exiting or entering Earth’s boundaries, the permission of the state overflown should not be required as long as the launching state is a party to the Outer Space Treaty.

However, it is arguable that a slightly more nimble agency, such as ICAO, should be given jurisdiction over activities that do

not go beyond "inner space"; the relevance of such an idea grows as non-state actors become increasingly involved in space activities.

IV. SPACE: AN EMERGING MARKET

Just as Russia began the space race by placing an 83.6 kilogram (184.3 pound) satellite on the tip of an ICBM, the private sector saw profit potential in satellite launches. Airanespace, the world's first commercial space launch system, was created in 1980, and the first purely private space launch occurred two years later. Almost immediately, U.S. officials began exploring how to best regulate such activities. In October 1984, President Reagan signed the Commercial Space Launch Act to achieve that result.

Six years later, President Reagan's successor, President George H.W. Bush, signed the Launch Services Purchase Act to require NASA to "purchase launch services for its primary payloads from commercial providers whenever such services are required in the course of its activities."

Thus, twenty years ago, it could be claimed that "[i]n the last half decade, the space transportation market has gone from a highly insular, government controlled and operated set of local monopolies to a fiercely competitive, multipartite international market."
Within just six years, commercial launches outnumbered government launches at Cape Canaveral, Florida, and states such as South Africa were rumored to be interested in the satellite launch business for its "potential economic payoff." Predictably, the U.S. Department of Defense announced plans to become 100% reliant on the commercial space launch industry by 2004, and NASA planned to follow.

With the possibility of U.S. satellites being launched from foreign states at lower costs, along with the understanding that launching was increasingly becoming a commercial, market-driven activity, analysts began to study potential legal issues.

V. SPACE LAW: ADAPTABLE TO MARKETS?

The contemplation of market forces was not on the agenda when the five general multilateral treaties on space law were drafted in the 1960s and 1970s. Of these five agreements, the Outer Space Treaty is the pillar of space law and provides the

80 South Africa's interest was noted in 1991. See Chow, supra note 58, at 53.
81 Comm. on Space Launch Range Safety, supra note 79, at 9.
85 Convention on Registration of Objects Launched into Outer Space, Jan. 14, 1975, 28 U.S.T. 695 [hereinafter Registration Convention]. In truth, the Registration Convention, drafted in 1974 and ratified by virtually every country, was the last successful treaty that has ever built or launched a satellite. See Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, opened for signature Dec. 18, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement]. The Moon Agreement actually entered force in 1984, but none of its thirteen parties (Australia, Austria, Belgium, Chile, Kazakhstan, Lebanon, Mexico, Morocco, Netherlands, Pakistan, Peru, Philippines, and Uruguay) has ever contemplated a lunar mission. See Missions to the Moon, Planetary Soc'y, http://www.planetary.org/explore/space-topics/space-missions/missions-to-the-moon.html (last visited May 21, 2014).
86 See Outer Space Treaty, supra note 70.
legal "framework for all other space treaties."87 It has over one hundred ratifications,88 "incorporates the [U.N.] Charter and all of international law,"89 and "at least some of [its] provisions have become customary international law."90 It was negotiated at the height of the Cold War,91 predates the first lunar landing,92 and, now in its forty-fifth year, has survived without amendment.93 Analysts suggest that attempts to revise it should be discouraged, because "once opened, attempted revisions could lead to decades of debate and negotiations."94 Others argue that "it makes more sense to address the few ambiguities and shortcomings in the treaty in ancillary treaties which expand upon the existing provisions of the Outer Space Treaty."95

It is significant that the term "space object," which is central to the five space law treaties, is nowhere specifically defined. Although the term is broad enough to encompass both intergalactic rockets and commercial satellites, it is unlikely that the drafters of the space law treaties had commercial concerns in mind during the treaty negotiations.

Indeed, market principles were so distant from the minds of the negotiators that during the drafting process, the Soviets pro-

88 There were 101 ratifications as of January 1, 2011. See Outer Space Treaty, supra note 70.
90 White, supra note 87, at 94.
94 Id. at 118.
95 White, supra note 87, at 96.
posed that space activities "be carried out solely and exclusively by [s]tates"; however, the Soviets eventually accepted the current language:

States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.

Even here, the words "non-governmental entities," while possibly including the private sector, may have primarily been intended to permit launches by universities and research institutes or for telecommunications purposes.

The Outer Space Treaty is rooted in the sovereign prerogative of the state under international law, and this suited both Soviet and American negotiators because "[e]ven in the absence of international cooperation, activities in space should be conducted in a manner that avoids infringing upon the interest of the other states because the freedom to use and explore outer space

97 Outer Space Treaty, supra note 70, art. VI.
cannot serve as a pretext for the violation of sovereign rights on Earth."\textsuperscript{100}

In keeping with the spirit of the Cold War, the treaty has "no provisions for...governing bodies"\textsuperscript{101} such as the ICAO Council, and it therefore arguably remains a creature of its time.\textsuperscript{102} "It is still characterized by a primary focus on [s]tates as actors in outer space."\textsuperscript{103}

In its first era, space law functioned as a branch of international law characterized by a treaty regime that aimed at ensuring peaceful uses of outer space for the benefit of humankind. However, in the wake of the commercialization of outer space, and prompted by the forces of globalization, space law started responding to continuing global changes. In the initial response, a "hybrid public-private [commercial space] environment," whereby the state provides infrastructure and incentives to the private sector to compete in the market, replaced the state governed and state controlled system. Consequently, what had been a defense and research and development orientation in space activities shifted towards a market orientation.\textsuperscript{104}

Given the origins of the Outer Space Treaty, its applicability to private sector actors has been questioned.\textsuperscript{105} It has been argued that the Treaty cannot meet the "growing need for effective mechanisms to regulate the activities of nongovernmental, private actors."\textsuperscript{106} Indeed, one author has concluded, "Since the international space conventions only deal with the rights and obligations of states, national space legislation offers states the opportunity to regulate internally the relationship between the

\textsuperscript{100} For the Soviet view, see Emilio Jaksetic, The Peaceful Uses of Outer Space: Soviet Views, 28 Am. U. L. Rev. 483, 491 (1978). The Soviets were particularly concerned about remote sensing of Soviet territory by U.S. spy satellites like the CORONA and later the GAMBIT. Of course, the Soviets were spying on the United States too, and none of this was changed by the passage of the Outer Space Treaty. See Pat Norris, Spies in the Sky 57-89 (2008).

\textsuperscript{101} White, supra note 87, at 95.

\textsuperscript{102} It "contain[s] both the aspirations and fears of the times." Gabrynowicz, supra note 89, at 1043.


\textsuperscript{105} Id. at 384-85.

\textsuperscript{106} Schrogl, supra note 103, at 273.
state and private enterprise involved in space activities and proportionate liabilities between them.\textsuperscript{107}

Under this scenario, all aspects of safety and security—the very areas where ICAO’s annexes have made such a profound difference in commercial aviation—are to be left to individual states, and this result is less than ideal:

In the coming months and years Europe and its member states and institutions will need to decide how to regulate this new class of aerodynamic space vehicles, particularly in relation to their airworthiness and spaceworthiness. Space tourism will happen, and the UK is prepared to take a leadership role in its development, in terms of technology, operation and regulation. Opening a dialogue now with EASA and other member states will allow Europe to establish a level playing field with pioneering countries such as the USA, adopting comparable regulatory frameworks to facilitate and encourage the development of this challenging, innovative, and exciting new industry.\textsuperscript{108}

Unless the search for “comparable regulatory frameworks” proposes to base new standards on U.S. law, particularly the Commercial Space Launch Amendments Act of 2004,\textsuperscript{109} serious consideration should be given to examining the potential for an international organization such as ICAO to regulate space.

VI. THE CALL FOR ICAO TO REGULATE SPACE

The idea that ICAO would play some role in regulating space-related transport predates the first lunar landing\textsuperscript{110} but was almost immediately caught up in the still-unresolved debate over the boundary between airspace and outer space.\textsuperscript{111} Nonetheless, ICAO began to take an active interest in the potential regulation of suborbital flights in January 2005, three months after Space-

\textsuperscript{107} Hanneke L. van Traa-Engelman, Commercialization of Space Activities: Legal Requirements Constituting a Basic Incentive for Private Enterprise Involvement, 12 Space Pol’y 119, 119 (1996).

\textsuperscript{108} Crowther, supra note 40, at 76.


ShipOne had claimed the ten-million-dollar Ansari X prize for operating two suborbital flights within five days.\textsuperscript{112}

Three months later, an ICAO working paper recommended: Vehicles which would effect [E]arth-to-[E]arth connections through suborbital 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.\textsuperscript{113}

The Chicago Convention applies to international air navigation but current commercial activities envisage [suborbital] flights departing from and landing at the same place, which may not entail the crossing of foreign airspaces. Should foreign airspace(s) be traversed, and should it be eventually determined that suborbital flights would be subject to international air law, pertinent Annexes to the Chicago Convention would in principle be amenable to their regulation.\textsuperscript{114}

The working paper identified not only the fact that the Chicago Convention is potentially applicable to international suborbital flights, but also that it is possible to modify the pertinent Annexes to the Chicago Convention.\textsuperscript{115} The conclusion is unsurprising and yet it was not reached in haste. This is because the idea that ICAO might be called to regulate the upper airspace was advanced in 2000 by Dr. Assad Kotaite, former President of the ICAO Council:

Laid out on the drawing boards of aircraft manufacturers and futurists are spacecraft that one day will carry passengers into the upper airspace and eventually into outer space. When that day comes, and it may not be that far away, real issues will need to be addressed by government regulators . . . . The idea of adopting ICAO as a model, or expanding the mandate of ICAO to encompass outer space . . . has merit.\textsuperscript{116}

Dr. Kotaite is not alone; others have argued for a clear distinction between activities in outer space and transportation leading up to the journey in outer space.\textsuperscript{117} Leading experts in space law

\textsuperscript{112} Peter van Fenema, \textit{Suborbital Flights and ICAO}, 30 \textit{Air \& Space L.} 396, 396 (2005).

\textsuperscript{113} ICAO Working Paper, \textit{supra} note 68, § 6.1 (emphasis added).

\textsuperscript{114} \textit{Id.} § 6.3.

\textsuperscript{115} \textit{Id.}


\textsuperscript{117} See Henri Wassenbergh, \textit{Access of Private Entities to Airspace and Outer Space}, 24 \textit{Annals Air \& Space L.} 311, 316 (1999).
argue that ICAO is in the best position to regulate upper airspace or inner space: “[T]he simplest and most cost-effective approach would be for ICAO to exercise authority to standardize suborbital and orbital traffic management, at the least standardizing navigation for vehicles traversing airspace.”

This confirms that to the extent that commercial aircraft and SATVs might be coexisting in airspace under the jurisdiction of ATC, they must come under a single, universal legal system such as the Chicago Convention and its Annexes. In the words of one scholar:

If, while carrying passengers, [a SATV] . . . intentionally enters foreign air space, one could consider this an international flight or international air service. That would surely trigger ICAO interest, at least from a formal point of view, as the operational and safety aspects of international air services are the raison d'être of ICAO.

Indeed, the principles of physics rather than law have the greatest influence here, due to the criteria of favorable launch conditions: “The most energy efficient orbit, that is one that requires the least amount of propellant, is a direct low inclination orbit. To achieve such an orbit, a spacecraft is launched in an eastward direction from a site near the Earth’s equator.”

There are consequently relatively few countries from which a spacecraft can be launched into space and then return to Earth without crossing through foreign airspace. In every

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118 Dempsey & Mineiro, Vacuum, supra note 10, at 3.
120 van Fenema, supra note 112, at 401.
122 These tend to be countries with a large east–west expanse, such as the former Soviet Union or China, or countries that have a major body of water located to the east of their territory.
123 Sea Launch offers an ocean-based launch platform in international waters in the middle of the Pacific Ocean, at 154° W along the equator. By the time the spacecraft crosses over the coast of Ecuador, its altitude is over 230 kilometers. See Launch Systems Overview, SEA LAUNCH, http://sea-launch.com/launch.aspx (last visited May 21, 2014).
124 Similarly, because inbound spacecraft approach from the east, a large east–west expanse or the presence of a large body of water to the east of a state’s territory avoids overflight of a foreign nation’s territory. For example, virtually all of the Soyuz spacecraft landed in the steppes of Kazakhstan. See Julie Robinson et al., Recent Research Accomplishments on the International Space Station, Presentation at the 2005 IEEE Aerospace Conference (Mar. 5–12, 2005).
other case, the Chicago Convention or its Annexes would be applicable to at least part of the journey.

A. GRANTING JURISDICTION TO ICAO

In the event that it is desirable to extend ICAO's jurisdiction to cover inner space, it would not be particularly complex to provide the legal basis for such jurisdiction:

ICAO [could] amend its Annexes to redefine aircraft to include aerospace vehicles, so that when they fly in airspace used by civil aircraft, the rules of safety and navigation are the same. . . . It created the definition of aircraft, and amended it to clarify that air cushion vehicles were not within the Chicago Convention; the ICAO could amend its Annexes again to clarify that sub-orbital vehicles fall within the definition of "aircraft."126

Other experts suggest that ICAO would also have to develop and adopt "a new and/or additional set of SARPs or Annexes to the Convention specifically designed to cater for the peculiar characteristics of such aerospace vehicles."127 However, based on past experience, this is well within the realm of possibility. In response to the Dawson's Field hijacking of September 1970,128 ICAO prepared Annex 17, Security Safeguarding International Civil Aviation Against Acts of Unlawful Interference, which was applicable as of February 27, 1975.129

Even in the event that an amendment to the Chicago Convention itself would be necessary, this is still not impossible. In 1984, as a result of the shoot-down of Korean Airline Flight 007, the ICAO assembly introduced Article 3 bis,130 which entered into force fourteen years later upon the receipt of its 102nd ratifica-

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tion in 1998.\textsuperscript{131} Thus, there are few scenarios under which ICAO would not be able to assume legal jurisdiction over inner space, if necessary.

VII. WHY ICAO

Aviation law has provided the basis for space law on issues such as registration of craft, rescue and return of personnel, liability, and traffic control.\textsuperscript{132} It therefore follows that ICAO might be able to offer some expertise with respect to enhancing the safety of SATV flights.

A. AIR TRAFFIC CONTROL

Although there is not a present need for space traffic management, with the anticipated growth in suborbital flights, it is not too early to begin to imagine how such a system might be implemented. However, "the existing body of International Space Law does not consider an authority controlling ‘space traffic’ anywhere in its text. This void must be filled before progressing."\textsuperscript{133}

A space traffic management regime has to consider the question of harmonizing national space legislation (much of which has yet to be established) and national licensing standards and procedures, since they may provide the building blocks for assuring technical safety.\textsuperscript{134}

At a basic level, such a system would have to include:

- right-of-way rules (comparable to "sail before motor" in maritime traffic), . . . [prioritization] with regard to [maneuvers], specific rules for the protection of human spaceflight, zoning (e.g., keep-out zones, providing special safety to military space assets), specific rules for the GEO, specific rules for satellite constellations, debris mitigation rules, safety rules for re-entry (e.g., descent corridors) and environmental provisions (e.g., the prevention of pollution of the atmosphere and the troposphere).\textsuperscript{135}


\textsuperscript{132} Sreejith, \textit{supra} note 104, at 367.


\textsuperscript{134} Corinne Contant-Jorgenson et al., \textit{The IAA Cosmic Study on Space Traffic Management}, 22 \textit{Space Pol'y} 283, 285 (2006).

\textsuperscript{135} Kai-Uwe Schrogl, \textit{The Concept of Space Traffic Management as a Basis for Achieving the Fair and Equitable Use of Outer Space}, in \textit{The Fair and Responsible Use of
However, a much more mundane issue confirms the need for global standards. Paragraph 2.29.2 of Annex 11 to the Chicago Convention makes English the language of the air. This allows a European crew to operate an Emirates Airlines flight from Dubai via Rio de Janeiro to Buenos Aires and speak one language with ATC at all times.

While there is a need to define rules, standards, and procedures that would apply with respect to international suborbital flight, at present there is no legal basis even for requiring a common language with respect to communication between pilots of suborbital flights operated by entities in different states. This is in dramatic contrast to the Chicago Convention regime, which mandates that the rules of the air in force over the high seas be established under the Convention. Article 37(c) of the Chicago Convention states that ICAO “shall adopt and amend from time to time, as may be necessary, international standards and recommended practices and procedures dealing with... rules of the air and [ATC] practices.”

Annex 11 to the Convention is one of those SARPs, and its paragraph 2.1.2 reads:

Those portions of the airspace over the high seas or in airspace of undetermined sovereignty where air traffic services will be provided shall be determined on the basis of regional air navigation agreements. A Contracting State having accepted the responsibility to provide air traffic services in such portions of airspace shall thereafter arrange for the services to be established and provided in accordance with the provisions of this Annex.

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138 Actually, English is not the “official” language but rather the language “predominantly used” since the 1950s. Around the world, ATC and pilots must speak English. Other languages are allowed by mutual consent of both parties in some countries. See Atsuchi Tajima, Fatal Miscommunication: English in Aviation Safety, 23 WORLD ENGLISHES 451, 453 (2004). Tajima’s article actually argues for common simplified English in communications between pilots and ATC. Id.
139 Chicago Convention, supra note 9, art. 37.
140 Id. art. 37(c).
141 Chicago Convention Annex 11, supra note 136, ¶ 2.1.2.
Indeed, responsibility is “contracted to specific national administrations for the provision of ATC services within specific oceanic regions.”

Over the North Atlantic, intercontinental air traffic is managed by UK National Air Traffic Services (Shanwick) and NAV Canada (Gander). Between them, they coordinate traffic over the busiest oceanic airspace in the world, handling approximately 430,000 flights in 2010.

To facilitate efficient ATC for aircraft flying between Europe and North America[,] a system of [organized] tracks has been devised which extends across the entire oceanic airspace. These tracks are redefined every 12 hours to take account of forecast meteorological conditions and the ‘tidal’ flow of traffic over the Atlantic [(i.e.,] eastbound in the early morning (UK time) and westbound in the afternoon). [Shanwick] is responsible for drawing up the optimum westbound tracks, while [Gander] handles the eastbound track system.

Paragraph 3.4.1(b) of Annex 11 mandates “consultation between the appropriate ATS authorities responsible for the provision of air traffic services in neighbouring airspace,” and thus Shanwick and Gander are in constant communication to facilitate the two-way flow of intercontinental air traffic over the North Atlantic and ensure the proposed routes are viable.

Further, the Procedures for Air Navigation Services—Rules of the Air and Air Traffic Services (PANS-RAC) are passed by the ICAO Council and provide the additional detail that makes today’s relatively seamless global air navigation system possible. Canadian Aviation Regulation (SOR/96-433) § 602.38 requires Canadian pilots to comply with the “Rules of the Air set out in Annex 2 to the Convention and the applicable Regional Supple-

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144 Id.
mentary Procedures set out in [ICAO] Document 7030/4."149 Most nations have similar requirements.150

If the Chicago Convention and the ICAO Council had not provided such an elaborate framework on which to build the intercontinental ATC system, global commerce would not be what it is today. Indeed, it might be very much like the early 1950s, when skies finally became so crowded151 over the United States that there were three mid-air collisions between June 1956 and May 1958, killing 185 people and prompting calls for a national ATC system.152 The Federal Aviation Act of 1958153 created the Federal Aviation Agency (now the Federal Aviation Administration), which was “charged with establishing an ATC to maintain safe separation of commercial aircraft through all phases of flight.”154

ICAO began examining international ATC issues in 1950,155 but technology was not as advanced as the political will to cooperate; therefore, as late as the early 1960s, the job of keeping aircraft from colliding was done by non-electronic means.156 As a result, it could be claimed that “air traffic control over the North Atlantic suffer[ed] from the necessity of each aircraft being spaced by departure times alone and, therefore, each carri[ed] with it thousands of cubic miles of [airspace].”157

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154 Geels, supra note 151, at 1011.

155 See MacKenzie, supra note 129, at 104.


157 Id. at 668.
Indeed, the regulations of the day required that the separation between two aircraft be at least (1) 120 nautical miles lateral separation, (2) 2,000 feet vertical separation, or (3) thirty-minutes flying time longitudinal separation.\textsuperscript{158}

Given that there were over 127 trans-Atlantic crossings per day by commercial aircraft in 1956,\textsuperscript{159} it quickly became obvious that international agreement on a technological solution would be required to handle an anticipated increase in traffic.\textsuperscript{160}

In 1960s terms, thirty-minutes flying time longitudinal separation meant 450 kilometers or 280 miles,\textsuperscript{161} a standard that would become increasingly difficult to meet in crowded skies. As a result, ICAO created detailed separation standards for different situations\textsuperscript{162} and also made provisions for Airborne Collision Avoidance Systems\textsuperscript{163} (ACAS).\textsuperscript{164}

In the absence of a Space Traffic system analogous to the ATS that governs the North Atlantic, it is not inconceivable that vast physical separation would be required between spacecraft. If one were to use the 1960s standard of thirty minutes of flying time, the physical separation between two spacecraft with the technical capabilities of SpaceShipTwo would be 1,125 miles or 2,000 kilometers, or the distance between Detroit, Michigan, and San Antonio, Texas.\textsuperscript{165}

While such separation is currently possible, if aerospace traffic grows as air traffic did, there will soon come a time when such physical separation is no longer logistically desirable. Even if technology advances, such as through the creation of vastly improved ACAS systems that allow for the reduction of physical space between spacecraft, such technology will only delay the

\textsuperscript{158} William Warntz, Transatlantic Flights and Pressure Patterns, 51 GEOGRAPHICAL REV. 187, 209 (1961).

\textsuperscript{159} There were actually 46,550 crossing that year. See id. at 210.

\textsuperscript{160} Sandretto, supra note 156, at 664, 668, 671.

\textsuperscript{161} This is based on the 550 miles per hour or 888 kilometers per hour cruising speed of the Douglas DC-8, which was one of the aircraft most commonly seen on the trans-Atlantic route. See Patricia M. McGinnis, Douglas Aircraft's DC-8 Made Its First Flight 50 Years Ago Last Month, BOEING FRONTIERS, June 2008, at 9.

\textsuperscript{162} ICAO Doc 4444-ATM/501, supra note 148, at 5-1 to 42.


\textsuperscript{165} Distance calculated by WEBFLYER, http://www.webflyer.com/ (last visited May 21, 2014).
moment when a space traffic system will be essential to safe navigation.

Predicting when that moment will arrive is difficult, but four things are certain:

1) There will come a time when a Space Traffic System is necessary;
2) “Space traffic management infrastructure and coordination is almost non-existent”;
3) There is currently no legal framework to support the implementation of such a system;
4) UN COPUOS, the seventy-six-member consensus-based U.N. body, which turned fifty years old in 2009, has not yet turned its attention to this issue, and significant short-term progress is unlikely.

In the absence of the creation of a space traffic management system, the majority of the contracting states of the Chicago Convention should support giving ICAO jurisdiction over ATC in upper airspace or inner space to ensure the safe navigation of SATVs at all times.

B. AVIATION SAFETY

“To avoid collisions, some international regulatory body is needed to provide uniform standards for national certification of space launch systems and vehicles, and their navigation through airspace.” As of 2003, space law had not “installed a definitional model such as that contained in the Chicago Convention, where ‘crew’ are linked to qualification and licensing requirements and passengers are left to the realms of provisions on international carrier liability.”

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166 Dempsey & Mineiro, Vacuum, supra note 10, at 1.
167 See Filho, supra note 133, at 179–80.
169 Space Generation Advisory Council member Alex Karl notes that the nations that rely on space assets for national security have not been strong supporters of Space Traffic Management. See Alex Karl, At the Crossroads: The Necessity for “Rules of the Road” for Space, 2 DISARMAMENT F. 45, 48 (2009).
law treaties do not contain any rules on how to deal with flight crew certification or passenger training.” Consequently, “there are no legal provisions in the body of international space law governing safety of passenger launch vehicles.” Thus, it is not surprising that when space law considers such matters, air law analogies are used.

If suborbital vehicles are “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 [s]tate aircraft under Article 3 of the Convention).”

“Although space transportation is by its nature risky, the long-term viability of a commercial human spaceflight industry will be dependent upon its safety record. Hence, the onus will be on operators to make safety and reliability a priority, and to demonstrate this to potential participants and regulators.”

ICAO’s demonstrable competence in adopting eighteen Annexes to the Chicago Convention, all of which contain SARPs to regulate international civil aviation efficiently over the past sixty years, may well make ICAO the “global forum of nations,” which may be needed to achieve consensus in the management of outer space.

Jack Howell, Director of ICAO’s Air Navigation Bureau in 2000, wrote: “From a technical standpoint, ICAO’s credibility is strengthened by the example set by the Organization in expertly migrating to the [communications, navigation, surveillance/air traffic management system], thus achieving a seamless and global air traffic system.” An analyst in ICAO’s legal bureau argues that issues involving security safety and even competition would be critical to the blurring of aircraft per se and aerospace planes. Moreover, the Chicago Convention, now in its seventh decade, has, through its eighteen Annexes,
published SARPs "for every conceivable aspect of international
civil aviation."\textsuperscript{180}

Following this logic, the EASA, which regulates airworthiness
and environmental compatibility on behalf of all EU members,
proposes "to complement existing rules to capture the specific
features of such [suborbital] [a]eroplanes, rather than develop-
ing new specifications from scratch."\textsuperscript{181} Nonetheless, as the EU’s
jurisdiction ends where “space” begins, the Outer Space
Treaty\textsuperscript{182} and national jurisdiction over space objects\textsuperscript{183} con-
tinue. Thus, individual EU states would have to arrange with the
EASA for that organization to be able to regulate space activities
on their behalf.\textsuperscript{184}

It is likely that the individual EU Member States will conclude
such arrangements with the EASA, but the fact that such ar-
rangements are necessary speaks to the need to define the
boundary.

C. LEGAL LIABILITY

There are also private law reasons that support defining the
boundary. The Liability Convention imposes liability with re-
spect to the launch of a “space object,” but although the term is
undefined, it is believed to pertain to objects either orbiting the
Earth or proceeding beyond Earth’s gravitational field.\textsuperscript{185} Indeed,
the Liability Convention is undoubtedly based on Article
VII of the Outer Space Treaty, which outlines the responsibility
of states with respect to the launching of objects in outer
space.\textsuperscript{186} Both of these agreements were drafted over four de-
cades ago—at a time when supersonic transport was envisaged
for intercontinental travel,\textsuperscript{187} anything else was science fic-

\begin{itemize}
  \item \textsuperscript{180} Id.
  \item \textsuperscript{181} Marciacq et al., supra note 41, at 1.
  \item \textsuperscript{182} Crowther, supra note 40, at 76; Outer Space Treaty, supra note 70, art. VIII.
  \item \textsuperscript{183} Outer Space Treaty, supra note 70, art. VIII.
  \item \textsuperscript{184} Crowther, supra note 40, at 76.
  \item \textsuperscript{185} See Chicago Convention, supra note 9.
  \item \textsuperscript{186} Outer Space Treaty, supra note 70, art. VII.
  \item \textsuperscript{187} Although various supersonic aircraft were planned, including the Boeing
2707, the Lockheed L-2000, the Tupolev TU-144, and the Concorde, only the latter
two ever flew, and only the last saw commercial service. See Walter J. Boine,
Beyond the Horizons: The Lockheed Story 349–50 (1998); I.N. Fridlyander,
Memoirs on the Establishment of Aerospace & Nuclear Engineering of Alu-
minum Alloys 78–80 (2d ed. 2006); Christopher Orlebar, The Concorde
Story (6th ed. 2004); Bill Yenne, Inside Boeing: Building the 777, at 16 (Sara
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tion, and the idea of a reusable shuttle for travel to outer space was in its infancy.

While the Liability Convention clearly applies to voyages to the "[M]oon or other celestial bodies" and to the "launching of an object into outer space," the same clarity does not apply with respect to suborbital flights. Indeed, while "[suborbital] space tourism has often been compared to air transport for reasons of legal analysis and development," the "question remains whether [suborbital] flight occurs in 'outer space' for purposes of international space law."

Indeed, as the Outer Space Treaty makes states responsible for "national activities in outer space," the only issue that is crystal clear is that national legislation will be required to deal with the legal liabilities of private companies that conduct activities in outer space, and these activities might include suborbital flights.

D. Passenger Liability

The Convention for the Unification of Certain Rules for International Carriage by Air (Montreal Convention) is the latest iteration in the Convention for the Unification of Certain Rules Relating to International Carriage by Air (Warsaw Convention) system of airline liability treaties governing passenger, baggage, and cargo claims. As with its predecessors, the Montreal Convention applies to the "international carriage of persons, baggage or cargo performed by aircraft for reward" and

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189 Indeed, the idea was top-secret. See T.A. Hepplewhite, The Space Shuttle Decision: NASA's Search for a Reusable Space Vehicle 206–25 (1999).

190 Outer Space Treaty, supra note 70, art. VII.

191 Id.


193 Id. at 418.

194 Outer Space Treaty, supra note 70, art. VI.

195 See von der Dunk, supra note 192, at 421–22.


aims to provide a uniform worldwide system of airline liability.\textsuperscript{198} Although the Warsaw Convention is not flawless, it does make the operating airline civilly responsible for damages resulting from its actions.\textsuperscript{199}

Contrast this regime with that of space law. For example, if a passenger on an aircraft operated by Virgin Atlantic suffers harm as a result of the carrier’s actions, the Montreal Convention specifies fora where an action may be brought and mandates that Virgin Atlantic would be responsible to the passenger. However, if a passenger on a space object launched by Virgin Galactic suffers harm, the state where the space object was launched, literally the “State Party to the Treaty that launches or procures the launching of an object into outer space,”\textsuperscript{200} would be responsible. This would result in cases in which passengers bring actions not against Virgin Galactic, but against sovereign states, and those passengers might be required to bring their actions in courts of the states against whom the actions are brought.

Clearly, the aviation liability system is more universal, predictable, and accessible than is the state-based liability system of space law. Thus, for this reason alone, consumers would prefer that commercial SATVs be considered aircraft rather than space objects.

E. LIABILITY FOR GROUND DAMAGES

Article II of the Liability Convention makes the launching state fully liable for any ground damages caused by a space object.\textsuperscript{201} Under Article 2 of the 1952 Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface (Rome Convention), the operator of an aircraft is liable for ground damages.\textsuperscript{202} Even though the Rome Convention was drafted twenty years prior to the Liability Convention, the latter attributes responsibility to state actors because space launches were clearly state affairs in the 1970s and the concept of private

\textsuperscript{198} Montreal Convention, \textit{supra} note 196, art. 1 (emphasis added).
\textsuperscript{199} See Warsaw Convention, \textit{supra} note 197, art. 17.
\textsuperscript{200} Outer Space Treaty, \textit{supra} note 70, art. VII.
\textsuperscript{201} Chicago Convention, \textit{supra} note 9, art. 2.
parties launching space objects was virtually unknown outside of James Bond films. 203

However, just as it makes sense for airlines to be held responsible for ground damages, so should the operators of SATVs.

VIII. WHERE TO DRAW THE LINE BETWEEN ICAO AND UNCOPUOS

Many space tourism flights are parabolic flights that “come close to the edge of outer space,” but “they never enter outer space” and therefore do not involve issues of space law. 204 However, there is no international agreement on the precise altitude at which one “slip[s] the surly bonds of [E]arth” to tread “[t]he high untrespassed sanctity of space.” 205

Nonetheless, the Fédération Aéronautique Internationale (FAI) recognizes the Kármán Line, which lies at an altitude of roughly 100 kilometers and is named for Hungarian-American engineer and physicist Theodore von Kármán, as scientifically separating the inner space of the atmosphere from the outer space based on the aerodynamic property and orbital velocity of the spacecraft. 206 It is not surprising that this same line was chosen by the X-Prize Foundation in defining the conditions for the ten-million-dollar Ansari X prize won by SpaceShipOne. 207 Indeed, although there is not a consensus on the border between airspace and outer space, most states would agree that the delimitation is somewhere between 80 and 110 kilometers above sea level. 208 However, 100 kilometers is roughly “the highest apogee of an airplane and the lowest perigee of a space object.” 209

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204 von der Dunk, supra note 192, at 402–03 (emphasis added).


209 Id.
[A] slow and haphazard consensus may be gradually arising that until specific developments would make such a consensus untenable once more, an altitude at 100 kilometers would be an appropriate altitude at which to separate the legally distinct areas of airspace and outer space, at least for those sets of rules that did not specifically focus on aircraft as opposed to spacecraft—or air transport functions as opposed to outer space-focused activities.\textsuperscript{210}

As of 2008, only one state, Australia, had found it necessary to define the border between airspace and outer space in national legislation, and it chose the 100-kilometer opinion.\textsuperscript{211} One can hope that should other states choose to pass national legislation on space matters, they will follow Australia's example. In the meantime, given that a definition between air and space is increasingly necessary to deal with anticipated growth in SATV traffic, it is not necessary to wait for UN COPUOS to define the boundary between inner and outer space.

Quite simply, ICAO seems to have a better track record of handling such delicate matters in an expeditious manner. Given that the same U.N. Member States who ratified the Chicago Convention also supported the creation of UN COPUOS, perhaps it is possible for the U.N. General Assembly to task ICAO with the responsibility to define the boundary, with the clear understanding that ICAO would have jurisdiction for matters below the boundary and UN COPUOS would have jurisdiction above the boundary.

For clarity, ICAO's jurisdiction could be further limited to scenarios where the following three conditions are present:

1) The purpose of voyage is to travel between two different parties to the Chicago Convention;
2) The vessel will not complete two orbits of the Earth;
3) The majority of the vessel's flight time, from the moment it takes off to the moment it lands, will be spent at an altitude of 100 kilometers or less.

Such a decision by the U.N. General Assembly could potentially ensure the safe growth of the SATV as a new form of transportation without interfering in any way with the legitimate jurisdiction of UN COPUOS over activities in outer space.

\textsuperscript{210} von der Dunk, \textit{supra} note 192, at 427.