"THERE IS NO GRAVITY...." PROPOSAL FOR A NEW LEGAL PARADIGM FOR AIR LAW AND SPACE LAW: ORBIT LAW

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[1] "A thesis is never 'finished'; you simply abandon it at its deadline!" D.C.L. candidate Melissa Martins Cassagrande, *Legal Research Methodology Lecture Notes*, (Faculty of Law, McGill University, 09 March 2007).

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ABSTRACT – ENGLISH

As the debate over demarcation between airspace and outer space remains unresolved, advancements in technology are bringing these two realms of flight closer than ever before. Rather than relying on traditional functional or spatial approaches to define the legal framework of flight, this paper proposes a completely new legal system based on orbital status known as "Orbit Law."

The first chapter examines the functional versus spatial debate, and highlights those aspects of existing International Air Law and Space Law which may be useful to an Orbit Law regime. Chapter II studies the science bridging air flight with space flight, and proposes the standardization of safety requirements for all suborbital and orbital flights. Finally Chapter III outlines the new legal principles of Orbit Law, highlighting innovative submissions for suborbital and orbital flights, solutions to issues of liability, and "Open Skies" for all flights.

ABSTRACT – FRANÇAIS

Tandis que la discussion en ce qui concerne la démarcation entre l'air spatial et l'espace extérieur reste irrésolu, les progrès technologiques ses rapprochent ces mondes du vol plus que jamais. Au lieu de se fier à les traditionnelles approches fonctionnelles ou spatiales pour définir le cadre théorique légal du vol, cette thèse propose un régime nouveau en ce qui se fonde sur le statut orbital, ou « Le Droit Orbital. »

La première chapitre discute la discussion fonctionnelle contre la spatiale, et dépouille ces éléments existant du Droit de l'Air et le Droit Spatial ce que peut être avoir son utilité pour le Droit Orbital. Le deuxième chapitre étude la science qui connecte le vol de l'air et le vol de l'espace, et propose la conformité des règles de la sûreté pour tous les vols. En fin, la troisième chapitre explique les principes nouvelles du Droit Orbital, magnifiant les idées novateurs pour les vol orbitals et sous-orbitals, les solutions de la responsabilité, et «les ciels ouvert » pour tous les vols.

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INTRODUCTION

International Air Law and Space Law consist of various treaties and jurisprudence, and currently exist as two separate, distinct legal regimes despite the "common bond" shared by both: flight. While the historical development of aviation and space travel clearly favored two separate systems, rapidly advancing technology and improvements in flight components have brought these two worlds closer together than ever before.

What is the common element that all flying machines must overcome in their quest for flight? Gravity. The author believes there will come a time when technology will enable us to overcome the bonds of gravity, and the terms "aircraft" and "spacecraft" will eventually become obsolete – instead replaced by a new flying machine known as an "orbital craft."

Rather than relying on the physical properties and reactions against air to obtain lift like an aircraft, or simply applying thrust to break free of gravity's grip like a spacecraft, these new craft may be able to utilize advanced technology to overcome or counter the effects of gravity, enabling the craft to elevate rapidly and to great heights. Relying on highly developed navigation and propulsion systems to control dimensional and directional status (pitch, yaw, roll and trajectory), these craft should be able to cover vast distances in very little time using fractional and sub-orbital flight paths, without the altitude constraints of aircraft, or the tremendous thrust requirements of spacecraft.

Additionally, their abilities may also include flights both within and beyond the Earth's orbit, much like modern spacecraft. But the key to their functionality would include the ability to easily operate in both the airspace and outer space environments, and return to Earth (or some other orbital location) once that particular mission is complete. Although the technology to enable rapid and easy transition between orbits may be decades away, forerunners to such craft have already been developed, while the science and technology continue to improve. For example, even older equipment such as the U.S. Space Shuttle, and recent inventions such as *SpaceShipOne*, have blurred the boundary lines and combined the characteristics of both air and space travel. Because these modern craft, as well as the future of air-space travel, are able to bridge the gap between both airspace and outer space, they pose a legal dilemma much like the one we face in modern times: how to differentiate between these two mediums of flight, and how to apply the current differing legal regimes to such flights.

Since the advent of space flight and exploration in the late 1950's, the boundary between the aerospace and outer space realm has been much debated, but has yet to be determined. Based on current legal regimes, flights which occur solely within the aerospace atmosphere are traditionally governed by Aviation Law or "Air Law;" should those flights cross international boundaries or the high seas, International Air Law applies. However, missions and vehicles which are intended for outer space launches are governed by what can be collectively referred to as "Space Law."

Because there is no known, scientifically-measurable line of demarcation between airspace and outer space, two schools of thought have emerged to distinguish between these realms. "Spatialists" favor the establishment of a clear boundary line between the two domains. Because there are two separate and distinct legal regimes for each region, delimitation should be accomplished once and for all. Spatialists wish to clearly identify borders between State-sovereign airspace and unencumbered outer space.

"Functionalists," on the other hand, see airspace and outer space as a continuum that should be governed by the activity taking place within that realm. If the activity is aeronautical, then Air Law should apply; if the activity is a space-based mission, then Space Law should apply. Because there is no clear break point between one region and the other, functionalists believe that the endeavor rather than a random border should determine the appropriate law.

Recent advances in technology have resulted in the development of craft which are able to fly within the Earth's lower atmosphere (the traditional realm of airspace) as well as the outer reaches of the mesosphere and thermosphere (which appears to qualify as outer space under either functional or spatial approaches). During much of its ascent and/or descent, the craft performs like an aircraft, but its ability to ascend above atmospheric limitations and its excursions into outer space appear to qualify it as a spacecraft. As these craft combine both air travel and space travel into one mission, it is uncertain whether the legal principles for air flight or space flight (or both) should apply to the craft, the mission, and its personnel.

Because the traditional schools of Air Law and Space Law have been unsuccessful in definitively characterizing such craft as "air" or "space," or in determining which regime of law should be applied to it throughout its flight, this thesis will propose a new legal approach to bridge the uncertain gap between airspace and outer space. This new legal paradigm, collectively known as **"Orbit Law,"** proposes to blend both the functional and spatial approaches to flight and recommend new legal guidelines founded on concepts from the existing Air Law and Space Law regimes. This paper will therefore conduct a theoretical, trans-systemic and positivist analysis of current International Air Law and Space Law systems, and propose a new legal paradigm based on ***orbital status*** rather than traditional spatial or functional components of flight.

The first chapter will begin with an overview of existing Air Law and Space Law, starting with the history and debate between functional and spatial approaches dividing airspace from outer space. Next, the fundamental principles of International Air Law will be examined by looking at the major international conventions and treaties for public and private Air Law, as well as jurisprudence from both of these areas. Issues dealing with tort law, State sovereignty and responsibility, and safety enforcement will be closely scrutinized to determine applicability and "best practices" for an orbital regime.

Space Law and its five founding treaties will also be analyzed: the *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* (Moon Agreement); the *Agreement on the Rescue of Astronauts, the Return of Astronauts and*

the Return of Objects Launched into Outer Space (Rescue & Return Agreement); the *Convention on International Liability for Damage Caused by Space Objects* (Liability Convention); the *Convention on Registration of Objects Launched into Outer Space* (Registration Convention); and 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). Those treaty principles which were founded in space flight, yet may also provide useful legal guidance for flights based on orbital status, will be highlighted.

Existing (predominantly U.S.) national law, as well as international law, will be analyzed throughout the chapter to identify effective methods of determining liability, and exercising State responsibility and control over air and space flights. Both overviews of Air Law and Space Law will place a strong emphasis on examining aspects of liability and insurance, issues of State sovereignty versus freedom of action, as well as the shortcomings these systems pose to modern developments in air and space flight. A prescriptive approach will be used to reflect the most useful aspects of this Air and Space legal background, and their potential applicability to the Orbit Law regime.

Advancements in technology and aviation will be highlighted in the next chapter, with additional focus on new trends and activities taking place between airspace and outer space. An inter-disciplinary approach will be employed to identify these technological advancements. Research and development conducted by governmental agencies, commercial enterprises, and other fields of technology will be analyzed. The

need for uniformity across the boundaries of airspace and outer space, and an overall emphasis on international safety standards, will be discussed. Recommendations for new "Orbital Standards" based on the International Civil Aviation Organization (ICAO) system will also be suggested.

Finally, a detailed proposal for a new legal paradigm known as Orbit Law will be submitted in the last chapter. Definitions of varying orbital status will be explained, and differing legal rules for sub-orbital, orbital, and inter-orbital flights will be proposed. Applications and limitations of liability will be a fundamental principle in each region of flight. New and potentially controversial proposals such as "Open Skies" and a "Sunset Clause" for certain aspects of the regime will also be discussed. Taking the most useful components of Air Law and Space Law, the Orbit Law system will potentially offer both short-term solutions to the rapidly approaching merger between airspace and outer space, as well as a long-term framework upon which to build solid legal guidelines for the continued exploration and use of both ethereal realms.

CHAPTER I

HISTORY OF AIR & SPACE LAW

Any vision for the future requires an understanding of the past. But as the author's thesis advisor shared on several occasions, "[Y]ou should not make laws for the past, but for the future."[1] Granted, the ideas introduced in the previous section and submitted throughout this thesis proposal may be for a very distant future. Aircraft might never become completely obsolete, while spacecraft might remain suited for flight only beyond the Earth's atmosphere. Nonetheless, current trends in technology support the notion for aircraft's gradual transition from Air Law to Orbit Law, while the development of craft which are able to span both air and space appear viable and conciliatory with this new legal regime.

During the course of the author's studies in International Air Law and Space Law, an idea began to germinate which might provide a unifying legal framework with "big picture" application to the notions of flight across all frontiers. To use an analogy from the author's time living abroad in Turkey, this idea might serve as a "zincir"[2] to unite and strengthen the tapestry of International Air Law and Space Law, and weave these separate strands of law into one artful composition that covers all forms of flight – a

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[1] Ram S. Jakhu, *Space Law: General Principles Lecture Notes*, (Faculty of Law, McGill University, 25 September 2006).

[2] From August 2004 to July 2006 the author and his family lived in Incirlik, Turkey, a small village outside the city of Adana in southeastern Turkey. During our time there we became close friends with Goeki Sariyildiz, an expert and proprietor of fine hand-woven carpets. For each of our purchases Mr. Sariyildiz wove a "zincir" along each end of the carpet between the end of the carpet's warp and the fringes. This chain-like plait, also known as a "chiti," served to strengthen the carpet and prevent the pile knots from shifting or dropping out of the warp. Strong, double Turkish knots (also known as Gördes knots) were used to ensure the carpet withstood wear and tear over time. Mehmet Ateş, TURKISH CARPETS, THE LANGUAGE OF MOTIFS AND SYMBOLS 20-22 (1995). Literally translated, zincir (pronounced "zin-jer") is a chain, or fetters. H.-J. Kornrumph, LANGENSCHEIDT'S UNIVERSAL DICTIONARY, TURKISH-ENGLISH, ENGLISH-TURKISH 196 (Resuhi Akdikmen ed., 1998).

"magic carpet," so to speak. Therefore, in order to gain a broader understanding of this synthesis of two separate legal regimes into one overarching new system, it is necessary to conduct an overview of the fundamental premises which form the foundation for Orbit Law.

One issue which has been a deeply-rooted concern for States since the advent of flight has been the notion of absolute State sovereignty over its territory.[3] But even before the launch of Earth's first artificial satellite on October 4, 1957, legal scholars advocated that it was not logical or desirable to extend State sovereignty beyond the airspace above such territory.[4] As more satellites were launched into orbit, the absence of State protests over the crossing of such satellites above their territory came to be considered "tacit or implied consent or agreement" for free passage.[5] This "consent or agreement" was formally recognized in the United Nations General Assembly (UNGA) Resolution No. 1721 XVI of 1961[6] and Resolution No. 1962 XVII of 1963.[7] These Resolutions were also viewed as legally binding principles[8] and later incorporated into the 1967 Outer Space Treaty,[9] which included the fundamental premise of freedom of outer space: "[O]uter space, including the Moon and other celestial bodies, shall be free

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[3] *Convention Relating to the Regulation of Aerial Navigation*, 13 October 1919, 11 L.N.T.S. 173, art. 1 [hereinafter Paris Convention].
[4] Ram S. Jakhu, *International Law Governing the Acquisition and Dissemination of Satellite Imagery*, 29 J. SPACE L. 65 at 73 (2003) [hereinafter *Satellite Imagery*].
[5] *Id.*
[6] *International Co-operation in the Peaceful Uses of Outer Space*, GA Res. 1721 (XVI), UN GAOR, 1961.
[7] *International Co-operation in the Peaceful Uses of Outer Space*, GA Res. 1962 (XVII), UN GAOR, 1963.
[8] Jakhu, *Satellite Imagery, supra* note 4, at 74.
[9] *Treaty of Principles Governing the activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, GA Res. 2222 (XXI), UN GAOR, 1966, 610 U.N.T.S. 205, 6 I.L.M. 386 [hereinafter Outer Space Treaty].

for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law."[10]

However, this freedom of use of outer space is not absolute, but only authorizes such action within the limitations prescribed and to the extent allowed by law.[11] In other words, the freedom of use of outer space by States is limited by analogous rights of other States[12] – a finding typically considered to be the opposite of that espoused in the *SS Lotus* case – "under international law everything which is not prohibited is permitted."[13] The Outer Space Treaty does impose some limitations on sovereign State action which may be referred to as "freedom of action," and which must be exercised "without discrimination of any kind," "on a basis of equality," and "in accordance with international law."[14] Therefore State equality (meaning equal rights of all States to explore and use outer space) under the Outer Space Treaty is understood to mean *de jure* equality or "sovereign equality"[15] under Article 2(1) of the Charter of the United Nations.[16] "(States) are equal before the law when they are equally protected in the enjoyment of their rights and equally compelled to fulfill their obligations."[17]

When Manfred Lachs described the parameters of State action in space, he Stated "[T]here can be no doubt that the freedom of action of States in outer space or on celestial bodies is neither unlimited, absolute or unqualified, but is determined by the right and interest of other States. It can therefore be exercised only to the extent to which

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[10] *Id.* at art. 1.
[11] Jakhu, *Satellite Imagery, supra* note 4, at 74.
[12] *Id.* at 76.
[13] Case of *SS Lotus*, (France vs. Turkey), PCIJ Ser., A. No. 10, 1927.
[14] Jakhu, *Satellite Imagery, supra* note 4, at 74-75.
[15] *Id.* at 75.
[16] CHARTER OF THE UNITED NATIONS, 26 June 1945, 59 Stat. 1031, T.S. 933, 3 Bevans 1153 [hereinafter UN CHARTER].
[17] Edwin D. Dickinson, THE EQUALITY OF STATES IN INTERNATIONAL LAW 3 (1920).

as indicated it does not conflict with those rights and interests. There should therefore be no antinomy between the freedom of some and the interest of all."[18] The fundamental principles of international Space Law, including these principles of freedom of exploration and use of outer space as codified in the Outer Space Treaty, have been accepted by virtually all countries by either express consent or acquiescence.[19] "These principles, therefore, are not only the treaty obligations undertaken by the States Parties to the Outer Space Treaty but would also operate as *jus cogens*."[20] On this same point it is also noteworthy that a number of temporary passages of satellites through State *airspace* while "going to" or "coming from" outer space have repeatedly occurred through the years without State protest,[21] the ramifications of which will be discussed in greater detail in the forthcoming passages. Proposals for an Orbit Law regime will therefore closely examine the roots of the functional-spatial debate, its growth and development (or lack thereof) through the years, and possible methods for grafting new ideas onto the fruitless debate of air-space demarcation.

A second major issue of concern in the evolution of 21st century Space Law revolves around the uncertainty of public and private-party responsibility, and the crucial agenda of liability for space activities. Governments face a diminishing role in the development of space activities as the global space industry becomes increasingly commercialized and privatized.[22] The increased role of the private sector and reduced

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[18] Manfred Lachs, THE LAW OF OUTER SPACE: AN EXPERIENCE IN CONTEMPORARY LAWMAKING 117 (1972).
[19] Ram S. Jakhu, *Developing Countries and the Fundamental Principles of International Space Law, in* NEW DIRECTIONS IN INTERNATIONAL LAW 351 at 362-63 (R. G. Girardot, *et al* ed., 1982) [hereinafter *Developing Countries*].
[20] *Id.*
[21] Myres S. McDougal, Harold D. Lasswell & Ivan A. Vlassic, LAW AND PUBLIC ORDER IN SPACE 203 (1963) (emphasis added).
[22] Eilene Galloway, *Space Law in the 21st Century*, 26-2 J. SPACE L. 187 at 190 (1998).

government regulation is creating a problem for determining appropriate regulations essential for the maintenance of an orderly space environment.[23] Based on the current structure of international Space Law, the twin concepts of State *responsibility* for any deviations from this corpus of law (including private activities), and State *liability* for any damage caused by space objects (including private entity objects), are likely the most significant and fundamental issues of international Space Law during this increasing era of privatization.[24] Therefore, the topic of primary importance for the public interest, as well as private enterprise, is liability.[25]

Major legal tools to achieve control over such issues include territorial jurisdiction over the activities, as well as personal jurisdiction over the entities holding a nationality from that particular State.[26] Some authors recommend additional analysis of the commercial development of space and the increasing role that international nongovernmental entities play, to ensure appropriate guidance and control is maintained by nation States.[27] Analysis of appropriate industry and safety standards, insurance, intellectual property rights, and liability should be incorporated as part of a thorough review.[28] Because of the previously mentioned advances in space expertise and equipment, there are concerns with maintaining fundamental standards of conduct for space activities. Rapidly evolving technology should not degrade the fundamental protocols of the Outer Space Treaty and other treaties designed to preserve international

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[23] *Id.*
[24] Frans G. von der Dunk, "Public Space Law and Private Enterprise. The Fitness of International Space Law Instruments for Private Space Activities," *Private Enterprise and Public Interest in the European 'Spacescape'* 1 at 25 (1998).
[25] *Id.* at 24.
[26] *Id.* at 25.
[27] Galloway, *supra* note 22, at 191.
[28] *Id.*

cooperation.[29] This study will therefore examine the interconnectivity between technological advancements and air-space flight, and the concerns over liability which stem from such progress. Proposals submitted in this Orbit Law system, and innovative methods for assignment of responsibility and liability for all flights, should alleviate much of the apprehension that both States and private entities share regarding transportation between airspace and outer space.

A. Debate Over the Boundary Between Airspace & Outer Space.

The debate on how to distinguish airspace from outer space is almost as old as the space age itself. The problems emerging from space exploration first entered the agenda of the United Nations in 1957, and were later placed on the agenda before the General Assembly through the establishment of an *Ad Hoc* Committee on the Peaceful Uses of Outer Space (COPUOS) in 1958.[30] Although this Committee initially focused on the debate of disarmament, its status was later made permanent in 1961 while its charter was expanded to include examination of all issues relating to the field of exploration and use of outer space by governmental and non-governmental organizations.[31] In 1962 the Scientific and Technical Sub-Committee and Legal Sub-Committee began their true substantive work and became the main center of international cooperation and coordination for exploration of peaceful uses of outer space.[32] Successive sessions

[29] *Id.*
[30] Manfred Lachs, *First Stages of International Cooperation, in* THE LAW OF OUTER SPACE 30 (1972).
[31] *Id.* at 31.
[32] *Id.*

focused on general and specific issues of Space Law, including the establishment of a frontier between outer space and atmospheric space.[33]

However, one of the early problems encountered by these Committees emerged from the fact that there exist no physical bases which might be used as a sound, scientific reason for defining a boundary between air space and outer space.[34] Although a great variety of various physical phenomena have been analyzed over the years, including "State of matter," "gravitational field," "electromagnetic," "geometrical/geographical," "biological/ environmental," and "technological" bases for demarcation, no scientifically based boundary has been discovered.[35] Arguments for a "physical boundary" versus a "functional boundary" therefore emerged to address the legal status of various space activities.[36]

However, COPUOS did not initially believe that the boundary problem deserved a priority consideration at that time because the absence of such demarcation did not create any serious problems.[37] Both space powers (the U.S. and U.S.S.R.) did not believe it was in their interest to establish boundaries which might restrict their freedom to operate in space, whether for peaceful or military purposes.[38] At the other end of the spectrum, though, early scholars noted that even a UN resolution urging free use of outer space did not infer a legal right for any State to propel its spacecraft through the national airspace

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[33] *Report of the Legal Sub-Committee*, 28 May – 20 June 1962, A/AC.105/6, 9 July 1962, pp. 3-9.
[34] Mishra and Pavlasek, *On the Lack of Physical Bases for Defining a Boundary Between Air Space and Outer Space*, 7 ANN. AIR & SP. L. 399 at 412 (1982).
[35] *Id.*
[36] *Id.*
[37] Ram S. Jakhu, *The Legal Status of the Geostationary Orbit*, 7 ANN. AIR & SP. L. 333 at 336 (1982) [hereinafter *Geostationary Orbit*].
[38] *Id.*

of other States merely to ascend or descend from free outer space.[39] International law has never accepted the view that a right of transit passage through one medium automatically carries with it the same right through other areas or media as well.[40] Therefore, the debate over a boundary between airspace and outer space was not simply theoretical, but embodied a conflict between exclusive State sovereignty over airspace, and freedom of outer space.[41] The height of any upper boundary of national airspace would be a limiting factor in the development of orbital flight, and unless the boundary was established fairly close to the Earth's surface, few States would be able to launch or receive a satellite in its national territory without passing through the national airspace of other States.[42] Thus with the advent of the space age, the stage was also set for a conflict between traditional international law, which was developed by a relatively small number of countries on the basis of strict observation of sovereignty, versus international Space Law, which was developed by the international community as a whole on the basis of international cooperation and co-sharing of international resources.[43]

1. Examination of the Spatial Approach.

Different and inconsistent legal regimes therefore emerged over the boundary between air space and outer space, which still represents the longest unresolved legal

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[39] John Cobb Cooper, *Legal Problems of Spacecraft in Airspace, in* FESTSCHRIFT FUR OTTO RIESE 465 (1964).
[40] *Id.*
[41] Ram S. Jakhu, *Application and Implementation of the 1967 Outer Space Treaty, in* 40TH COLLOQ. L. OUTER SPACE 442 (1997) [hereinafter *1967 Outer Space Treaty*].
[42] Cooper, *supra* note 39, at 466.
[43] Jakhu, *Developing Countries, supra* note 19, at 363.

problem of the UNCOPUOS Legal Sub-Committee.[44] One school of thought stressed the need for a clear internationally agreed upon boundary between the two regions, thereby regulating activities according to the place where they occurred – the so-called "spatial" approach to standardization.[45] Spatialists stressed the need for clear demarcation between airspace and outer space, as each country exercised complete and exclusive sovereignty over its territory, while outer space remained free for exploration and use by all States.[46] Delimitation remains necessary to provide and facilitate application and development of outer Space Law, to define the upper limit of State sovereignty and safeguard national air space, and avoid State disputes over such boundaries.[47]

Some scholars proposed a new international convention fixing the height of the upper boundary of national territorial airspace.[48] 40 kilometers was originally estimated to be the maximum height to which normal aircraft could be flown, while 80 kilometers represented the approximate upper limit of aerodynamic lift.[49] 120 kilometers was also proposed as an early estimate of the lowest practical altitude of free orbital flight.[50] This later notion gained support in 1968 from the International Law Association, who proposed that the term "outer space" should include all space at and above the lowest perigee achieved by any satellite put into orbit as of 27 January 1967 (the date when the Outer Space Treaty was opened for signature).[51] This same agency later recognized that

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[44] Jakhu, *1967 Outer Space Treaty, supra* note 41.
[45] *Id.*
[46] Jakhu, *Geostationary Orbit, supra* note 37, at 338.
[47] *Id.*
[48] Cooper, *supra* note 39, at 466.
[49] *Id.*
[50] *Id.*
[51] *Resolution on Space Boundaries*, 53RD CONFERENCE OF THE INTERNATIONAL LAW ASSOCIATION (Aug. 1968).

an altitude of 100 km had been growingly acknowledged by States and space experts as "outer space."[52]

Through the years a demarcation has been tacitly acknowledged and variously based on the lowest altitude at which Earth orbit can be maintained by a satellite, a somewhat randomly selected altitude of 100 kilometers, or an *a priori* notion regarding how little air might exist before a sector is deemed "outer space" and not "airspace."[53] Many States which were formerly proponents of the functionalist approach gradually shifted their beliefs over the years. One such shift occurred within the Soviet Union, a former functionalist State, when they published a working paper in 1979 proposing an "Approach to the Solution of the Problems of the Delimitation of Airspace and Outer Space."[54] This tripartite proposal Stated that the region above 100 (110) kilometers altitude above sea level is outer space, that this boundary between airspace and outer space should be established by treaty, and that States' space objects shall retain the right of overflight at altitudes lower than 100 (110) kilometers for the purpose of reaching orbit or returning to the launching State.[55]

The U.S.S.R. reiterated this approach in a 1983 working paper as well. Once again they recommended that "outer space" should be established at an altitude not exceeding 100 kilometers and confirmed by an international agreement.[56] The right of

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[52] *Resolution on Space Boundaries*, 58TH CONFERENCE OF THE INTERNATIONAL LAW ASSOCIATION (Sept. 2, 1978).
[53] Martine Rothblatt, *Legal Aspects of Geostationary Platforms in the Stratosphere*, AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS 1 (1999).
[54] Bin Cheng, *The Legal Regime of Airspace and Outer Space: The Boundary Problem Functionalism Versus Spatialism: the Major Premises, in* STUDIES IN INTERNATIONAL SPACE LAW 425 at 427 (Bin Cheng ed., 1997).
[55] *Id.*
[56] *Union of Soviet Socialist Republics: Working Paper*, U.N. Doc. A/AC.105/C.2/L.139 (April 4, 1983).

innocent (peaceful) passage over other State territories at altitudes below 110 kilometers would also be recognized in this proposed instrument.[57]

But in the twenty years that followed these proposals, little progress was made in resolving the boundary problem. As recently as 2003, the Report of the Legal Sub-Committee of COPUOS revealed that this Committee continues to struggle with the same definitional problems presented decades earlier.[58] Despite the establishment of a Working Group to address "Matters Relating to the Definition and Delimitation of Outer Space," little headway has been made to find an approach suitable to all delegates.[59] While some delegations expressed the view that a functional approach should be taken in relation to the exploration and use of outer space, others believed that such an approach would have a negative impact on State sovereignty over national airspace.[60] Other delegates also expressed support for the delimitation of outer space at an altitude of 100-110 kilometers and the right of innocent passage during space launches and returns to Earth[61] – the same proposal championed by the former Soviet Union many years before. Given the lack of agreement on such issues, delegations continued to express concern that the "lack of a definition and delimitation of outer space would bring about legal uncertainty with regard to Space Law, which provided that outer space was free for exploration and use by all States, and Air Law, which provided for sovereignty over national airspace."[62]

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[57] *Id.*
[58] U.N. COPUOS, 46th Sess., U.N. Doc. A/AC.105/805 (2003).
[59] *Id.*
[60] *Id.*
[61] *Id.*
[62] *Id.*

Australia has fully embraced the spatial approach as one of the first countries to use domestic legislation to set a particular altitude as the official boundary between airspace and outer space.[63] As part of its official legislative definitions, "launch," "launch vehicle," "return," and "space object" each incorporate specific references to objects and/or payloads which exceed a distance "of 100 km above mean sea level."[64] These specific references setting 100 km as the official boundary were added to the original 1998 Act through the Space Activities Amendment Act 2002,[65] due in part because the former "lack of a precise definition of the term 'outer space' had led to uncertainties with respect to what launch activities were covered under the Australian Space Activities Act of 1998."[66]

South Africa has also taken a similar approach in its division of air from space through official domestic legislation.[67] But rather than setting a particular altitude as the breakpoint between one region and another, the South African law instead simply defines outer space as "the space above the surface of the Earth from a height at which it is in practice possible to operate an object in an orbit around the Earth."[68] Ironically this boundary effectively sets outer space at the point of lowest perigee of a satellite, which in some instances could be at altitudes of as low as 80 km for highly-elliptical orbits – a location much lower than that (100 km mark) traditionally favored by the spatial approach.[69] It is also worth noting that the South African definition for *suborbital* flight includes "the trajectory of any object which leaves the surface of the Earth due to a

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[63] *Space Activities Act 1998* (Cth.) [hereinafter *1998 Act*].
[64] *Id.* at s. 8.
[65] *Space Activities Amendment Act 2002* (Cth.).
[66] Peter van Fenema, *Suborbital Flights and ICAO*, 30 AIR & SP. L. 396 at 398 (2005).
[67] *Space Affairs Act*, No. 84 of 1993.
[68] *Id.* at s. 1.
[69] Peter van Fenema, *Law of Space Applications Lecture Notes*, (Faculty of Law, McGill University, 19 March 2007).

launch, but returns to the surface of the Earth without completing an orbit around the Earth."[70] This author believes that the South African approach might represent an initial fledgling solution to functional-spatial differences, as the orbital components of these definitions are one precursor for solving the problems of an air-space boundary, and in fact comport precisely with the notions of Orbit Law proposed and explained later in this paper.

The European Union (EU) also appears to be favoring the spatialist approach in recent legislation. In a recent European Union Council Regulation referencing "space qualified" materials, items which are launched to heights of 100 km or more qualify for this special status.[71] "'Space Qualified' refers to products designed, manufactured, and tested to meet the special electrical, mechanical or environmental requirements for use in the launch and deployment of satellites or high altitude flight systems operating at altitudes of 100 km or higher."[72] Although there are currently no other known domestic instances of official spatial demarcation by European States, this action by the EU Community represents a significant, and perhaps premature, step towards "uniformity" which might bind and limit its members in future air/space activities. For each of those States which side with the spatial approach, all activity falling below that ultimate boundary between air and space is no longer protected by the "freedoms" of space.[73] The Air and Space treaties which dictate the boundaries of authorized action in each realm will be explained in greater detail later in this chapter.

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[70] *Space Affairs Act, supra* note 67, at s. 1.
[71] Council Regulation 1334/2000 of 22 June 2000 Setting Up a Community Regime for the Control of Exports of Dual-Use Items and Technology, Annex I (L 159) 25.
[72] *Id.*
[73] Outer Space Treaty, *supra* note 9, arts. I, II.

2. Examination of the Functional Approach.

The second approach which emerged to offer guidance across the expanse between airspace and outer space saw no need for boundaries, because all activities should instead be regulated according to their nature and purpose rather than a location of occurrence – a "functional" determination of applicable law.[74] These proponents found nothing "magic" about an altitude of 100 kilometers or fractions of difference in air pressure, and instead believed that law should be based on function and desired result, not happenstance coordinates.[75] For example, if an object were able to function like a satellite as a result of helium pressure instead of orbital mechanics, it should be treated like a satellite.[76] The functionalist approach in essence saw no need to establish a fixed boundary, as airspace and outer space existed as a continuum in which the *activity* should dictate the law governing it – aeronautical activities governed by aeronautical law, and space activities by Space Law.[77] Some early authors predicted that adherence to "fixed lines or putative horizontal sheets" created legal difficulties, and that this problem would eventually transform itself from one of boundaries to one of activities.[78]

While this functionalist prediction had the initial support of a number of States, including both major space powers, its emergence as a unifying policy never came to pass.[79] But a number of States including the United States, United Kingdom, and Federal

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[74] Jakhu, *1967 Outer Space Treaty*, *supra* note 41, at 445.
[75] Rothblatt, *supra* note 53, at 4.
[76] *Id.*
[77] Jakhu, *Geostationary Orbit*, *supra* note 37, at 337-38.
[78] Cheng, *supra* note 54, at 425-26.
[79] *Id.*

Republic of Germany continued to argue against the imposition of a fixed boundary between airspace and outer space.[80] The inability of most countries to monitor such a boundary; inadequate examination of relevant scientific, legal, technical, and political factors; and potential inhibiting effect that a fixed boundary might impose on future space use and exploration negated any boundary-based justifications.[81]

During the evolution of space flight, no State ever objected to the overflight of artificial Earth satellites above their territories, during which time some craft ascended and descended through the territorial air spaces of different States.[82] Therefore, some scholars proposed that such passage coupled with the cardinal freedom of exploration and use of outer space appeared to have created a limited international custom.[83] Analysis of this implied freedom to go into outer space and return to Earth while traversing foreign airspace led those authors to support the functionalist cause.[84] If an aerospace object was used for the primary purpose as a device operating in outer space, Space Law should apply to it.[85] Stephen Gorove summarized it thusly:

> Once the primary purpose of the object is determined, the corresponding legal regime applicable to it should continue to be applied for the duration of the object's flight, whether in the airspace or outer space, at a particular time. Attempting to proceed otherwise would lead to conflicting interpretations with respect to the applicable law and would greatly confuse the problem. If the primary function of the aerospace object was to operate as a spacecraft, then Air

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[80] *Id.*
[81] *Id.*
[82] Stephen Gorove, *Aerospace Object – Legal and Policy Issues for Air and Space Law*, 25-2 J. SPACE L. 101 at 109 (1997).
[83] *Id.* at 110.
[84] *Id.* at 109-10.
[85] *Id.*

> Law would not be applicable to it except in situations where the craft returns in a non-accidental situation to a non-launching State. Aerospace objects launched into outer space are subject to the rules governing the registration of objects so long as the primary purpose of the object has been to operate as a spacecraft. Such an object should be governed by the national laws of the launching State, or if it was launched from a platform in outer space, it should be governed by outer space rules. As long as the object's primary function was to operate as a spacecraft – its safe passage to and from outer space has now attained the status of international customary law.[86]

Although the functionalist approach appears to bestow more potential freedoms on those activities destined for space, it still fails to successfully address dual-use (airspace-outer space) craft mentioned elsewhere in this paper, and leaves other questions such as the extent of State-sovereign airspace unanswered.

3. Common Issues to Both the Functionalist and Spatialist Approach – State Sovereignty.

Despite the apparent contradictory methods of division between airspace and outer space, it should be noted that the physical boundary notion considers a physical *condition*, while the functional boundary concerns the use of physical means towards a particular *application*.[87] Both methods of analysis are therefore "physical" and represent no real difference between the two – there is merely a change in vantage point and

[86] *Id.*
[87] Mishra and Pavlasek, *supra* note 34.

perspective.[88] The attempt to impose a boundary is therefore an arbitrary and artificially-conceived decision with no physical foundation behind it, but has nonetheless emerged as a result of social, cultural, economic, historical, and political forces influencing the perception that a definition or differentiation between airspace and outer space is needed.[89]

The aforementioned issue of State sovereignty has likely been one of the primary reasons for the perceived need for a boundary. At one end of the spectrum are scholars such as Cheng, Dembling and Terekhov, who do not believe customary international law allows free passage of aerospace objects through sovereign airspace – State sovereignty reigns supreme.[90] Other scholars have taken a middle-ground approach recognizing limited incursions by space objects into State airspace, while Finch and Christol have asserted the outright existence of such a right of passage.[91]

It should not be surprising that the International Civil Aviation Organization (ICAO) was brought into the debate in recent years as well. In 1986, a Draft Brief for the ICAO Observer to the Legal Sub-Committee of the U.N. Committee on the Peaceful Uses of Outer Space (COPUOS) was prepared and of particular interest to ICAO.[92] As the Legal Sub-Committee continued to examine the definition and delimitation of outer space and the character and utilization of the Geostationary Orbit, a study of the Chicago Convention and other international Air Law instruments was recommended.[93] Because ICAO's input was confined to factual information on the Chicago Convention with

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[88] *Id.*
[89] *Id.*
[90] Gorove, *supra* note 82, at 109.
[91] *Id.*
[92] *Draft Brief for the ICAO Observer to the Legal Sub-Committee of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS)*, C-WP/8158 15/1/86 (Jan. 15, 1986).
[93] *Id.*

respect to the concept of airspace, it did not formulate any specific policies to be presented to COPUOS. ICAO did bring to the attention of the Legal Sub-Committee that ICAO was "responsible for developing the position of international civil aviation in all matters related to the study of questions involving the use of space technology for air navigation purposes" and "for stating the position of international civil aviation on all related outer space matters."[94] As such, ICAO came to a highly noteworthy finding in its interpretation of the Chicago Convention and international Air Law to be presented to the Legal Sub-Committee of UNCOPUOS: "The right of innocent passage of spacecraft through the sovereign airspace is a proposal *de lege ferenda* (i.e. a legislative proposal not reflecting the existing law); such right does not exist under the present international law of the air; an unconditional right of passage through the sovereign airspace does not exist even with respect to civil aircraft and is specifically subject to special authorization with respect to State aircraft and pilotless aircraft."[95]

UNCOPUOS also submitted a number of questionnaires to various States in an effort to refine the legal status of aerospace objects.[96] The insights and recommendations offered by this diverse group of States yielded significant legal observations. State sovereignty versus freedom of space remained at the forefront of these studies, while several States' analysis appeared to support a functionalist position. For example, the Czech Republic observed that there has not yet been sufficient support for the right of innocent passage of ascending or descending space objects to recognize it as a customary

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[94] *Id.*
[95] *Id.* (emphasis added).
[96] U.N. GA Questionnaire on Possible Legal Issues with Regard to Aerospace Objects: Replies from Member States, U.N. Doc. A/AC.105/635 (1996).

rule of international law.[97] However, they did highlight that no protests against such passage have occurred, and that an explicit admission and eventual regulation of truly innocent passage should be considered.[98] Accordingly, the norms of national and international Air Law would only be applicable to aerospace objects whose purpose was aeronautics, not aerospace vehicles which would be considered space objects.[99] The Czech Republic also concisely summarized liability issues for both regimes – aircraft liability being governed by international treaties and some national law, and attributable to private persons; whereas space object liability is governed by international law and attributable to international persons.[100] Unfortunately, due to problems with the extent and bases of liability, jurisdictional concerns, and the myriad of other differences between aircraft and spacecraft flights and registration, the Czech Republic believed the likelihood of establishing a legal regime to govern such air and space activities was remote.[101]

Despite Russia's former transition from a functionalist approach to an apparent belief in the spatialist system,[102] many of its Questionnaire answers seemed to revert back to functionalist frames of reference. They, too, believed that the issue of paramount importance was whether or not procedures should be brought into effect for regulating and notifying States of the passage of aerospace objects through the airspace of its territory.[103] However, the legal regime applicable to such flights must differ according to its purpose; for aerospace objects undertaking an Earth-to-Earth mission without entering

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[97] *Id.*
[98] *Id.*
[99] *Id.*
[100] *Id.*
[101] *Id.*
[102] Cheng, *supra* note 54, at 427; *U.S.S.R. Working Paper, supra* note 56.
[103] U.N. GA Questionnaire on Possible Legal Issues with Regard to Aerospace Objects: Replies from Member States, U.N. Doc. A/AC.105/635/Add.1 (1996).

outer space, international Air Law would apply.[104] Objects undertaking an Earth-orbit mission would fall within the jurisdiction of international Space Law.[105] As discussed later in this paper, these recommendations are quite similar to the author's proposals for an orbital law system. But the Russians distinguished their recommendations for aerospace objects based on the object's designation, i.e. whether the object was a transportation system intended for carrying payload from one Earth-point to another, or whether it was designated to be launched into outer space.[106] While the object's intent or designation will play a role in this paper's new Orbit Law proposals, other factors will also influence the application of appropriate legal standards.

Germany remained true to its functionalist roots in their answers to the Questionnaire. Preferring the term "space transportation system" to the ambiguous and yet-defined term "aerospace object," Germany's delegates believed that space transportation systems were space objects and subject to international Space Law throughout its flight through airspace and outer space.[107] They also recommended elaboration of a common legal solution for space objects re-entering the airspace of foreign States, as sovereignty remained a particular concern of many other legal regimes.[108] An interesting portion of the German analysis included references to the flight of the U.S.S.R. Space Shuttle Buran in 1988. Because the Shuttle's trajectory and re-entrance into Baikonur apparently took it through the airspace of Turkey, this flight provided some precedence for overflight of a space object with no known (Turkish or

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[104] *Id.*
[105] *Id.*
[106] *Id.*
[107] U.N. GA Questionnaire, *supra* note 96.
[108] *Id.*

other) State objection to such territorial infringement.[109] Although the delegation was quick to point out that no customary international law exists since the one and only known precedent of the Buran overflight did not constitute international *practice*,[110] this event remains an important factor in the evolution of Air and Space Law and highly relevant to proposals for an Orbit Law system.

Russia referenced a very similar instance of international overflight by a space object in their delegation's response to this Questionnaire. Regarding precedents for the passage of aerospace objects re-entering the Earth's atmosphere, Russia referred to the flight of the U.S. Space Shuttle Atlantis in March 1990.[111] A few hours before the Shuttle's trajectory would bring it over certain eastern regions of the U.S.S.R., the United States furnished data about its planned flight to the Soviet Union as a matter of courtesy and on the basis of goodwill.[112] However, Russia indicated that the fact that such information was furnished should not be deemed to set a precedent.[113]

The absence of other State responses to this Questionnaire supporting a right of passage for ascending or descending space objects does not appear to substantiate such passage as a customary rule of international law.[114] But as previously mentioned, several States including Germany and Russia explicitly admitted that a right of *innocent* passage which was not prejudicial to the peace, good order or security of subjacent States *should* be considered as a way to legalize the actual practice, while support for customary international law enabling passage of aerospace objects after re-entry into the Earth's

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[109] *Id.*
[110] *Id.*
[111] U.N. GA Questionnaire, *supra* note 103.
[112] *Id.*
[113] *Id.*
[114] Gorove, *supra* note 82, at 108.

atmosphere was evolving.[115] It is also momentous that these two episodes referenced in the Questionnaires represent uncontested overflights into State airspace by space objects (i.e. Space Shuttles) designed for the transport of astronauts, and not simply satellite overflights. Although the Buran flight was unmanned,[116] its ability to carry passengers marries well to the Russian emphasis of examining the space object's designation as a sub-orbital or space-bound transportation system for cargo and/or passengers.[117]

There also appear to be additional instances of overflight, but few details on the particulars of those launches, from the Russian cosmodrome of Baikonur. The cosmodrome, which is 125 kilometers (75 miles) long and 85 kilometers wide, borders the Syr Daria river in southwestern Kazakhstan and is wholly administered by Russia,[118] but is described as not allowing due-east launches (the most efficient) due to lower stages impacting China.[119] Although no details could be found describing former eastern launches which may have crossed Chinese airspace, or lower stages of launch vehicles landing in China, these descriptions and the current prohibition against such launch trajectories tends to support their occurrence at some point in previous launches. Of equal significance is the fact that no record of Chinese protests over such launches or impacts could be found either.

In the Republic of Korea's U.N. General Assembly Questionnaire responses regarding aerospace objects, they also acknowledged the special problems that "sovereignty over airspace, aerial safety and so on" posed during the flight of an

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[115] *Id.*
[116] Felicity Barringer, "Soviet Space Shuttle Orbits and Returns in Unmanned Debut" *New York Times* (Nov. 16, 1988) A1.
[117] U.N. GA Questionnaire, *supra* note 103.
[118] _____. "Russia, Kazakhstan extend Baikonur cosmodrome lease to 2050" Spacedaily.com (12 Sept. 2004), online: <http://www.spacedaily.com/2004/040109151358.forhgci8.html>.
[119] Rocket & Space Technology, "World Space Centers," online: Rocket & Space Technology <http://www.braeunig.us/space/center.htm>.

aerospace craft, and recommended that the "spatial approach has more merit than the functional approach under the present international legal system because the former can more easily decide the law to be applied."[120] Their observations also included a considerably different approach to objects passing through other State airspace when entering or leaving orbit, recommending that international Air Law or the relevant State's domestic law be applied to the space object to address any problems of sovereignty or security.[121] The Korean delegation also believed that simply because countries did not raise any objection to the passage of space objects over their airspace did not signify approval of such passage as international practice or precedence; rather, they speculated that those States simply did not have information about the passage and there was no perceptible disadvantage with such passage at that time.[122]

In a more recent related case of overflight concerns, the U.S. and Canada engaged in diplomatic negotiations regarding the planned launch of a rocket scheduled to fly over the area of Newfoundland.[123] Canadian officials expressed concern over the planned 2005 launch of a Titan IV missile by the U.S. Air Force from Cape Canaveral, Florida after learning that its flight path would take the missile over the Grand Banks off Newfoundland.[124] Fearing that debris from the launch would endanger Canadian oil platforms in this area, officials from Ottawa contacted the United States government and obtained an "indefinite delay" for such testing.[125] However, it is important to note that the basis for the Canadian objection stemmed from concerns over the potential hazard

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[120] U.N. GA Questionnaire, *supra* note 103.
[121] *Id.*
[122] *Id.*
[123] ____. "Missile Test Delayed After Sparking Scare at Oil Platforms" *CBC News Canada* (08 Apr. 2005), online: CBC.ca <http://www.cbc.ca/canada/story/2005/04/07/nfld-oil-050407.html>.
[124] *Id.*
[125] *Id.*

posed by falling debris from the launch to the Hibernia and Terra Nova oil platforms – debris which included a 10-ton solid rocket booster which was estimated to fall in an area within 27 kilometers of the Hibernia oil rig.[126]

As negotiations continued between the two governments, Canada ultimately capitulated and withdrew their objections to the launch after receiving "written assurances that any risk to offshore activity has been mitigated."[127] After receiving "precise assurances that the US Air Force would be able and prepared to destroy the rocket in the unlikely event that unforeseen circumstances arise that could result in the rocket booster falling outside of the identified safety zone," Deputy Prime Minister and Minister of Public Safety and Emergency Preparedness Canada Anne McLellan provided officials in Newfoundland written declarations that all safety mechanisms were in place to protect all offshore operations.[128] The launch ultimately occurred on April 30, 2005 without incident.[129]

There was no objection noted by Canadian officials that such a launch would be in violation of Canadian airspace, but simply concerns by Newfoundland and Labrador premier Danny Williams that the rocket could cause damage to the oil platforms if it dropped any debris.[130] Given the distance between Cape Canaveral and Newfoundland for this projected polar launch, it is highly unlikely that the rocket's trajectory and altitude obtained by the time it overflew the Grand Banks would still be in an area

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[126] *Id.*

[127] _____. "Premier Williams Pleased to Receive Requested Assurances from Federal Government on Safety of Offshore Vessels During Launch of Titan IV Rocket" *News Releases Government of Newfoundland and Labrador Canada* (14 Apr. 2005), online: NLIS 2 <http://www.releases.gov.nl.ca/releases/2005/exec/0414n02.htm>.

[128] *Id.*

[129] _____. "April 2005 in Canada" *Wikipedia the Free Encyclopedia* (30 Apr. 2005) online: Wikipedia.org < http://en.wikipedia.org/wiki/April_2005_in_Canada>.

[130] *Id.*

possibly considered to be Canadian airspace (less than 100 km). Therefore, this episode of diplomatic negotiations for space object overflight can be distinguished by concerns over safety rather than sovereignty. Although State interests in safety are also often linked with matters of sovereignty, in this instance corporate concerns raised to the Canadian government prompted the Canadian-U.S. intervention.[131]

4. Common Issues to Both the Functionalist and Spatialist Approach – Liability.

Although later sections of this Chapter will more closely examine the statutory bases and jurisprudence of *liability* for air and space flights, it is useful to first examine the topic from the shared perspective of a functional-spatial interest. By looking at the risks of error and concerns over accountability shared by all flight participants regardless of location or function, one might gain valuable insight into possible solutions to this financial burden and danger shared by all who fly.

Various commercial industries have increased their involvement in space activities which were formerly under State control, such as space transportation, satellite communications, remote sensing, and even commercial launch ventures.[132] However, such developments create unanswered questions about the accession of international organizations to the existing body of Space Law, and issues of responsibility and liability for private operators.[133] Unfortunately the development of Space Law in this area remains sluggish, with little to no enthusiasm to re-write or codify international principles

[131] "Missile Test," *supra* note 123.
[132] Peter Jankowitsch, *The Role of the United Nations in Outer Space Law Development: Past Achievements and New Challenges*, 26-2 J. SPACE L. 101 at 108 (1998).
[133] *Id.*

and rules to address these new developments.[134] Not only have "major (State) players in space politics" been reluctant to create too stringent a body of Space Law, but new commercial players have also resisted the introduction of a legal framework they consider to be an artificial barrier to their activities.[135] It therefore remains debatable to what extent economic globalization can safely and successfully continue without some degree of regulation.[136]

This stagnation of *corpus juris spatialis internationalis* represents the single most important gap opening up in international Space Law proper: the absence of regulation of economic and commercial aspects of space activities.[137] Because the fundamental freedom to undertake space activities applies to private space activities also, the related obligations of Article VI of the Outer Space Treaty of authorization and continuing supervision should be a principle concern for States.[138] However, these obligations and their connection to liability in Article VII (as well as indirectly in Article VI) and the Liability Convention constitute only a minor part of the body of Space Law.[139] Despite the devotion of these treaty areas to this subject, this category has received very little elaboration through the years, while State implementation at the national level has taken rather different directions.[140]

As it will be explained later in this chapter during the analysis of the space treaties, the exclusive character of State liability and responsibility would seem to

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[134] *Id.*
[135] *Id.* at 109.
[136] *Id.*
[137] von der Dunk, *supra* note 24, at 24.
[138] *Id.* at 25.
[139] *Id.*
[140] *Id.* at 24.

necessitate careful regulatory measures at the national level.[141] National legislation is indispensable in implementing international Space Law; indeed a number of rules on the public international level call for national implementation by individual States vis-à-vis the non-governmental entities under their jurisdiction.[142] And the twin concepts of responsibility and liability should prompt States to take domestic action to monitor and control those activities for which they could be held accountable at the national level.[143] Frans von der Dunk emphasized the importance of such State action when he Stated:

> Only once such States have taken up the baton and indeed have started to exercise some substantial measure of authorization and supervision – in other words: jurisdiction – the question becomes acute for private enterprise, whether this freedom has also been translated on the national and private level.

The Liability Convention[144] and Outer Space Treaty[145] set no limits on the amount of potential compensation for damages caused by space activities. The liability system therefore provides relevant States the choice either to transfer this unlimited liability to the private entities to be licensed (and thereby making it largely impossible for private enterprise to take insurance), or to establish a limit of reimbursement nationally (acting as a re-insurer for damage claimed internationally above the national limit).[146] While some States have maintained jurisdiction over private entities through the establishment of a national licensing system for space activities,[147] a number of States have not yet taken any legislative activities to regulate those private activities for which they might be held

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[141] *Id.*
[142] *Id.*
[143] *Id.* at 25.
[144] Convention on the International Liability for Damage Caused by Space Objects, 961 U.N.T.S. 187 (29 Mar. 1972), arts. I, II, III [hereinafter Liability Convention].
[145] Outer Space Treaty, *supra* note 9, arts. VII, VI.
[146] von der Dunk, *supra* note 24 at 17.
[147] *Id.* at 25.

responsible and/or liable at the international level.[148] Accordingly, accountability at the international level suffers from considerable uncertainties and inconsistencies.[149]

Von der Dunk argues that States are obviously the best controllers of private enterprise, possessing the legislative machinery to monitor and enforce compliance with established norms.[150] However, he believes that international legislation is necessary to define the parameters and scope within which such control of private space activities should take place.[151] In other words, international action is needed to determine substantive guidance (including uniformity of regulation), and structural guidance (minimizing State discretion to decide which categories of private activities they are answerable for at the international level).[152]

Orbit Law will hopefully provide the necessary framework and guidance sought by von der Dunk and needed by the space industry to chart its course with some stability and predictability. Later portions of this thesis will explain Orbit Law's ability to mesh State action, private action, liability and responsibility into one comprehensive system of apportionment. Simply Stated, the solution directly relates to both functional and spatial notions that have come full-circle and are now considered "customary Space Law"[153] as previously summarized in this chapter. Restating the first notion: no nation objected to satellites flying over its territory, leading to the conclusion that a right developed for such flights.[154] Second, there is no legal distinction between airspace and outer space, but such activities have thus far been conducted on the basis that airspace extends to the

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[148] *Id.* at 26.
[149] *Id.* at 25.
[150] *Id.* at 26.
[151] *Id.*
[152] *Id.*
[153] Galloway, supra note 22, at 188.
[154] *Id.*

height where planes can fly, while outer space begins where objects can remain in orbit.[155]

States are currently charged with responsibility for authorizing and continually supervising national governmental and nongovernmental entities,[156] thereby ensuring *State* involvement in all issues of satellite overflight and the air/space distinction. Said another way, States are so intricately tied to the issues of sovereignty and liability that Orbit Law will use this "common ground" as the building blocks for its initial structure. After all, both national and international legislation begin with State involvement, interaction and cooperation. Orbit Law will initially maintain this *status quo* of State predominance over all issues of flight. However, *orbital status* will also be a factor in determining which principles of tort law are applicable to each particular flight situation. Ceilings of liability may also play a role in Orbit Law to alleviate the heavy financial burden that both States and private parties share when trying to insure space operations. As Orbit Law matures, notions of sole-State responsibility may be phased out over time in favor of more progressive apportionment of liability, updated principles of tort law, and equitable division of risk and insurance costs between actors.

B. Examination of the Fundamental Principles of International Air Law Relevant to an Orbit Law Regime.

Fortunately, or perhaps unfortunately, the current structure of International Air Law is bifurcated into two separate systems: one accord generally dealing with issues of

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[155] *Id.*
[156] Outer Space Treaty, *supra* note 9, art. VI.

liability, with the other legal mechanism generally dealing with air transportation across international boundaries. While this bifurcated approach lacks the uniformity of application that a unicameral structure or singular treaty might provide, it nonetheless remains fairly easy to analyze the issues of liability and international transit under the current two-tier scheme. Perhaps the evolution of Orbit Law will provide the consistency and harmonization that multilateral agreements and the Warsaw Convention's progeny have sought over the years. But before one can obtain legal homogeny in International Air Law, it is first necessary to analyze these historical legislative efforts and attempts to standardize the legal issues that international air travel poses to the public sector, private industry, and the individual traveler.

1. Paris Convention/Chicago Convention Overview.

The fact that the principles of the Chicago Convention[157] have endured for over 60 of aviation's nearly-100-year history is a testament to the solid foundational supports upon which this treaty was founded. The strength of these various supports has been emphasized by different scholars. One of the basic principles reaffirmed by the Chicago Convention was the core foundation of its predecessor,[158] the Paris Convention of 1919[159]: "the Contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory."[160] Other scholars have identified ICAO's navigational, environmental, efficiency and economic functions as the manifest

[157] Convention on International Civil Aviation, 61 Stat. 1180 (1944) [hereinafter Chicago Convention].
[158] Paul S. Dempsey, PUBLIC INTERNATIONAL AIR LAW (Montreal: McGill University Centre for Research in Air & Space Law, 2006) at 6.
[159] Paris Convention, *supra* note 3, art. 1.
[160] Chicago Convention, *supra* note 157, art. 1.

responsibilities laid out by the Chicago Convention.[161] The noted Professor John Cobb Cooper identified territorial sovereignty, national airspace, freedom of the seas (and their airspace), and nationality of aircraft as bedrock principles laid down by the Chicago Convention.[162] However, in examining the balance of standards set forth in this instrument, this author concurs with the belief that the Chicago Convention's emphasis on *safety* to be the key goal of the Convention and its offspring ICAO,[163] with all other issues having either peripheral of direct ties back to this fundamental genus of international Aviation Law.[164] The remainder of this section will examine the Convention's pendulum-swing back and forth between respect for State sovereignty and the necessity for uniform safety standards in international aviation.

The fact that the Paris Convention Stated, and the Chicago Convention reiterated, that "recognition" of State sovereignty over its territorial airspace was a fundamental right enjoyed by all States marked the rejection of any possibility for absolute freedom of airspace.[165] Delegates of these two Conventions elected not to embrace the older concept of maritime law championed by Hugo Grotius favoring "freedom of the seas" and unencumbered commercial use of the oceans.[166] Rather, the Paris Convention and its predecessor Paris Conference of 1910 produced the "first evidenced general international agreement that usable space above its lands and waters of a State is part of its

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[161] Dempsey, *supra* note 158, at 7-9.
[162] John Cobb Cooper, *Backgrounds of International Public Air Law*, 1 Y.B. AIR & SP. L. 3 (1967).
[163] ICAO is the International Civil Aviation Organization established in Part II of the Chicago Convention to facilitate safety and navigation, and provide uniformity of standards across borders. *See* Dempsey, *supra* note 158, at 6.
[164] Dempsey, *supra* note 158, at 6, 37-43.
[165] *Id.* at 13.
[166] *Id.*

territory."[167] It also suggested that the prevailing customary international law at the time was indeed the fundamental principle of State sovereignty over its airspace.[168]

This Article 1 language present in both Conventions represents a midpoint in the previously-referenced pendulum swing – an emphasis on State sovereignty, coupled with State desire for self-protection and safety. Because the Chicago Convention superseded the Paris Convention,[169] the remainder of its Chapter I "General Principles" sought more to define the boundaries of territory,[170] differentiating civil versus State aircraft,[171] and emphasizing the safety measures and protections to be afforded civil aircraft.[172] These Articles represented a definite shift from the Paris Convention's previous emphasis on limitations of peacetime flight,[173] military prohibitions,[174] and unlawful incursions[175] in its Chapter I.

Although the Chicago Convention's Chapter I "General Principles" continue to recognize State-sovereign airspace, and hence require any scheduled flights to have permission to enter that State's territory,[176] Article 3 *bis* accentuates existing international law on authorized responses to unauthorized encroachments of State airspace.[177] Above all, the protection of civil aircraft shall not be compromised.[178] Added in the aftermath of the Korean Air Lines airplane Flight 007 shoot-down by USSR fighter aircraft, Article 3 *bis* recognized that the use of weapons against civil aircraft was unlawful, independent

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[167] Cooper, *supra* note 162, at 12.
[168] Dempsey, *supra* note 158, at 13.
[169] *Id.* at 14.
[170] Chicago Convention, *supra* note 157, art. 2.
[171] *Id.* at art. 3.
[172] *Id.* at art. 3(d), 3 *bis*.
[173] Paris Convention, *supra* note 3, art. 2.
[174] *Id.* at art. 3.
[175] *Id.* at art. 4.
[176] Chicago Convention, *supra* note 157, art. 6.
[177] *Id.* at art. 3 *bis*.
[178] Michael Milde, *KE 007 – "Final" Truth and Consequences*, ABHANDLUNGEN ZLW 42 JG. 4 at 361-62 (1993).

and apart from this Article's passage.[179] Limitations on authorized State responses to such incursions will play an important role in Orbit Law.

One of the interesting dichotomies of the Chicago Convention is seen in the next Chapter, "Flight Over Territory of Contracting States,"[180] and Chapter VI's safety requirements ("International Standards and Recommend Practices" (SARPs)).[181] So while Articles 12 and 6 establish State rules of flight and permissions of entrance respectively, each of these State requirements must also be harmonious with all ICAO standards.[182] Accordingly, Article 12 reminds States that these rules and ICAO standards *shall* be applicable to *all* flights over the international airspace of the high seas.[183]

Although Article 3 seems to exempt State aircraft from being subject to the Convention's standards,[184] the remainder of the Convention highlights a number of apparent exceptions to the limitations of Article 3. The first exception lies in the functional approach to aircraft – any craft used for military, customs or police functions is deemed a State aircraft under Article 3(b).[185] Additionally, a craft claiming civil status must not be armed, any violation of which may disqualify it from claiming civil status.[186] But because of this same functional approach, a craft traditionally considered to be a State asset might qualify as a civil aircraft. For example, even a military "fighter"

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[179] *Id.* at 362 (emphasis added).
[180] Chicago Convention, supra note 157, ch. II.
[181] *Id.* at ch. VI.
[182] *Id.* at art. 37.
[183] *Id.* at art. 12 (emphasis added).
[184] *Id.* at art. 3.
[185] Michael Milde, *Public International Air Law, Guest Lecture Notes*, (Faculty of Law, McGill University, 02 November 2006).
[186] *Id.*

aircraft that is (unarmed and) performing a humanitarian mission such as vaccine delivery might qualify as a civil aircraft.[187]

Although State and civil aircraft have separate legal status, the rules of flight, safety, air traffic control and navigation are applicable to both categories of aircraft.[188] Article 12 re-emphasizes that *all* aircraft are also subject to the rules of flight above any particular State; thus there is an *international* responsibility to follow local rules of flight.[189] Interestingly, States also appear to sacrifice some measure of sovereignty in Article 16 – States have an inherent right to search *any* craft landing or departing from its territory.[190] Because many States consider their State aircraft to be sovereign and not subject to foreign search, this treaty requirement could lead to conflict and disputes between States. The traditional notions of sovereignty applicable to State aircraft are therefore are not as broad as Article 3 appears on its face – an important exception that should carry over to the Orbit Law regime.

Conflict between State sovereignty and efforts at achieving safety standards is further evidenced in Chapters II, V and VI of the Chicago Convention. Proponents of State sovereignty find support for their position in Article 6. When one State alleges another is not complying with the Convention's SARPs, it may prohibit that State's airlines from entering its airspace in a "coercive act of self defense" trying to enforce compliance with those SARPs.[191] So while airline traffic rights between States may be subject to negotiation under Chapter II, safety compliance under Chapters V and VI is

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[187] *Id.*; Dempsey, *supra* note 158, at 27.
[188] Milde, *supra* note 184.
[189] *Id.*
[190] Chicago Convention, *supra* note 157, art. 16.
[191] Paul S. Dempsey, *Public International Air Law Lecture Notes*, (Faculty of Law, McGill University, 19 October 2006).

not. The emphasis on State responsibility for ensuring its craft's and personnel's airworthiness is found in Chapter V, Article 33, "Recognition of certificates and licenses."[192] Unfortunately, the language of Article 33 also creates a potential conflict of laws by requiring other States to recognize as valid those SARP certifications issued by other contracting States, provided that "such certificates or licenses were issued or rendered valid are equal to or above the minimum standards which may be established from time to time pursuant to this Convention."[193]

The potential for conflict emerges in any one of several scenarios. An obvious problem occurs when one State claims compliance with the SARPs in accordance with Article 33, yet another State does not believe that first State has adhered to the requirements, or refuses to honor that State's certificates or licenses. Should the concerned State elect to close its "gates" of international air access to its borders, Articles 1 (and 6) of the Convention effectively serve as sovereign assets enabling that State to "blacklist" another State from entering its skies.[194] As long as "transportation is the gatekeeper to the market,"[195] and control of inter-State flights still rests with each sovereign State, enforcement of Article 33's SARP recognition requirements may be difficult.

However, there is some precedence supporting Article 33 prevalence over Article 6 State sovereignty. In the case of *British Caledonian Airways v. Bond*, the DC Circuit Court sided with this posture, when certain foreign carriers assured the U.S. that its fleet of DC-10 aircraft had passed inspection in the aftermath of a U.S. DC-10's crash in

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[192] Chicago Convention, *supra* note 157, art. 33.
[193] *Id.*
[194] Dempsey, *supra* note 158, at 46-47.
[195] Paul S. Dempsey, *Public International Air Law Lecture Notes*, (Faculty of Law, McGill University, 14 September 2006).

Chicago.[196] Although the FAA tried to ban all foreign DC-10's from entering its airspace, the DC Circuit Court required that these foreign certificates be honored.[197] In doing so, it should not be overlooked that this decision still supported one (other) notion of State sovereignty by requiring other States to honor valid certifications of airworthiness.

Article 38 authorizing "Departure from international standards and procedures" produces another potentially thorny area of conflict.[198] Presumably in an effort to appease proponents of State sovereignty, the drafters of the Chicago Convention included Article 38 authorizing "opt out" provisions for those States that found certain SARPs "impracticable to comply...with any such international standards or procedure...."[199] If a State follows proper procedures and notice requirements to ICAO as outlined in this Article, then such actions appear to adhere with the remainder of the Convention's requirements.[200] Therefore any State which might be compliant with the requirements of Articles 33, 37, and 38, yet find itself blacklisted by another State, might successfully argue on the precedence of the *British Caledonian v. Bond* case that any such action is unauthorized, and perhaps even contrary to the non-discrimination clause of Article 11.[201] Unfortunately this author believes that Article 38's efforts at preserving State sovereignty are contrary to the remainder of the Convention's goals of safety and uniformity of standards. Hopefully as ICAO moves more towards safety management systems rather

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[196] 665 F.2d 1153 (D.C. Cir. 1981).
[197] *Id.* at 1161.
[198] Chicago Convention, *supra* note 157, art. 38.
[199] *Id.*
[200] *Id.*
[201] *Id.* at art. 11.

than SARP checklists consisting of thousands of items,[202] each sovereign State will work together and with ICAO to meet the ultimate goals of safety and security, thus promoting confidence in global aviation.[203] In the meantime the Chicago Convention still represents one of the most successful multinational instruments in history, providing a sound multilateral exchange of aviation rights and responsibilities.[204] As the author previously summarized, "[A]s a source of public international law, the Convention dictates State relationships with its carriers, and with those of other States. By regulating safety and operational fitness, airworthiness of craft and crew, and compliance with SARPs as outlined in the Convention and its Annexes, States are able to negotiate with other States under the assurance that foreign carriers entering its airspace will also comply with these minimum standards for international aviation safety."[205]

2. Warsaw Convention/Montreal Convention Overview.

Private international Aviation Law "took flight" and began to achieve much needed uniformity in the 1920's, culminating in the inception of the Warsaw Convention[206] in 1929.[207] Unfortunately, subsequent efforts through the years to update this legal regime led to fragmentation rather than unification of a consistent method of

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[202] Don Bliss, *Public International Air Law, Guest Lecture Notes*, (Faculty of Law, McGill University, 05 October 2006).
[203] Dr. Asad Cotate, *Public International Air Law, Guest Lecture Notes*, (Faculty of Law, McGill University, 23 November 2006).
[204] Dempsey, *supra* note 158, at 33.
[205] C. Brandon Halstead, *Public International Air Law, Final Examination*, (Faculty of Law, McGill University, 19 December 2006).
[206] *Convention for the Unification of Certain Rules Relating to International Transportation by Air*, 12 October 1929, 137 L.N.T.S. 11, 49 Stat. 3000, TS No. 876, ICAO Doc. 7838 [hereinafter *Warsaw Convention*].
[207] Paul S. Dempsey & Michael Milde. INTERNATIONAL AIR CARRIER LIABILITY: THE MONTREAL CONVENTION OF 1999 (Montreal: McGill University Centre for Research in Air & Space Law, 2005) at 1.

resolution for aviation injuries, losses, and damage disputes.[208] The resulting methods of liability determination have led to numerous possibilities – each one fractured and dependent upon which international treaty the interested State(s) had adopted: the Warsaw Convention of 1929; the Warsaw Convention as amended by the Hague Protocol of 1955;[209] the Warsaw Convention as amended by the Hague Protocol supplemented by the Guadalajara Convention of 1961;[210] the Warsaw Convention as amended by Additional Protocol No. 1 of Montreal;[211] the Warsaw Convention as amended by the Hague Protocol and by Additional Protocol No. 2 of Montreal;[212] the Warsaw Convention as amended by the Hague Protocol and Montreal Protocol No. 4;[213] the Montreal Convention of 1999;[214] or applicable domestic law if the transport falls outside the traditional international law regime, or no common liability convention exists between the relevant States.[215]

With the creation of the Montreal Convention in 1999, this new attempt at unification sought not to amend the Warsaw Convention, but rather to replace the series of Protocols and inter-carrier agreements with a unified, passenger-friendly legal

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[208] *Id.*
[209] *Protocol to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air Signed at Warsaw on 12 October 1929*, 28 September 1955, ICAO Doc. 7632 [hereinafter *Hague Protocol*].
[210] *Convention Supplementary to the Warsaw Convention for the Unification of Certain Rules Relating to International Carriage by Air Performed by a Person Other than the Contracting Carrier*, 18 September 1961, ICAO Doc. 8181 [hereinafter *Guadalajara Convention*].
[211] *Additional Protocol No. 1 to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air*, 25 September 1975, ICAO Doc. 9145 [hereinafter *Montreal Protocol No. 1*].
[212] *Additional Protocol No. 2 to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air, as Amended by the Protocol Done at the Hague on 28 September 1955*, 25 September 1975 ICAO Doc. 9146 [hereinafter *Montreal Protocol No. 2*].
[213] *Additional Protocol No. 4 to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air Signed at Warsaw on 12 October 1929, as Amended by the Protocol Done at the Hague on 28 September 1955*, 25 September 1975, ICAO Doc. 9148 [hereinafter *Montreal Protocol No. 4*].
[214] *Convention for the Unification of Certain Rules Relating to International Transportation by Air*, 28 May 1999, ICAO Doc. 9740 (entered into force 4 November 2003) [hereinafter *Montreal Convention*].
[215] Dempsey & Milde, *supra* note 207, at 1-2.

regime.[216] Most notably the new treaty established a two-tier liability system with strict liability up to 100,000 Special Drawing Rights [SDR's],[217] and unlimited presumptive liability above that amount.[218] This Montreal Convention also established (much lower) limitations of liability for loss of cargo or baggage, in addition to streamlining the documentation process for air cargo.[219] While "punitive, exemplary or other non-compensatory damages"[220] are not recoverable based on this Convention's "principle of restitution,"[221] less clear are the notions of "accident," "bodily injury" or recovery for emotional damages.[222] The issues of air carrier liability remain of primary importance in the Montreal Convention's application to an Orbit Law regime.

Courts have held common carriers to a higher duty than just reasonable care for their passengers.[223] With the substantial amount of common law addressing the principles of liability which evolved through the years, drafters of the Montreal Convention sought to preserve much of the jurisprudence of the Warsaw Convention and its subsequent Protocols.[224] Much of the text and structure of the Montreal Convention is therefore taken *verbatim* from the Warsaw Convention, but now includes six different official translations as opposed to the Warsaw's original French interpretation.[225] It is believed that the Montreal Convention will likely prevail at the common law for 21st

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[216] *Id.* at 2.
[217] Special Drawing Rights are calculated by the International Monetary Fund based on the fluctuating value of the Euro, British Pound Sterling, Japanese Yen, and U.S. Dollar. *See* Dempsey & Milde, *supra* note 207, at 2.
[218] *Id.*
[219] *Id.* at 3.
[220] Montreal Convention, *supra* note 214, at art. 29.
[221] *Id.* at Preamble.
[222] Dempsey & Milde, *supra* note 207, at 3-4.
[223] *Id.* at 9.
[224] *Id.* at 7.
[225] *Id.* at 42-43.

century air travel, but creative jurisprudence is being used to address many of the questions of liability that the Convention failed to resolve.[226]

One section which remained consistent between both Conventions included the regime of liability – in cases of international transportation, carriers remained liable in the event of an accident causing death, wounding or bodily injury on board the aircraft, or during embarkation or disembarkation.[227] A presumption of fault and reversed burden of proof was also maintained, enabling a carrier to exonerate itself only upon proving that it had taken all necessary measures to avoid the loss, that it was impossible to do so, or that the claimant was contributorily negligent.[228] Threshold requirements of "international" transportation and "bodily injury" caused by an "accident" have therefore been the subject of much litigation; in the absence of any of these requirements, the plaintiff is without a remedy under the Conventions.[229] Should a claimant meet some of the criteria, but fail to meet the conditions for *liability* under the Conventions, recovery under local law is also precluded.[230]

Assuming the passenger meets these prerequisite qualifications, carriers are strictly liable up to the first 100,000 SDRs, with unlimited liability above that amount based on presumptive fault with a reversed burden of proof.[231] However, some scholars have expressed concern with a compensation structure of unlimited liability unless the carrier can prove it was not guilty of any negligence.[232] Opponents of the current system of liability argue that there has never been a case where the air carrier was not guilty of

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[226] *Id.* at 43.
[227] *Id.* at 58.
[228] *Id.* at 59.
[229] *Id.* at 71.
[230] *Id.* at 210-11; *Israel Airlines v. Tseng*, 525 U.S. 155 (1999).
[231] Dempsey & Milde, *supra* note 207, at 121.
[232] Thomas J. Whalen, *Private International Air Law, Guest Lecturer Notes*, (Faculty of Law, McGill University, 04 October 2006).

some fault, so the "defense" of supposedly limiting strict liability to 100,000 SDRs is in fact a fallacy which creates an impossible burden on the airlines.[233] Those on the reverse side of this argument remind us that the two tier liability system still only provides damages up to the amount proven, so that for any loss of life or other injury, it must be proven that the compensation sought is worth what is actually claimed.[234] And because the Inter-Carrier Agreement of 1995[235] essentially provided this same (potentially unlimited) system of recovery for passengers, the actual added expense of raising airline insurance coverage amounts with the passage of the Montreal Convention has been described as "minimal."[236]

Determination of whether the events causing loss actually stemmed from an "accident" under the Montreal Convention have involved extensive analysis of Article 17 by various courts. While those events on board the aircraft seem straightforward, case law addressing those possibilities *beyond* the craft's bulkheads has focused on whether the passengers were in the *control* of the carrier, the *location* of the injury, the *activity* of the passenger(s), and the *imminence* of boarding or de-boarding.[237] Courts have also taken a very liberal view of what constitutes an Article 17 "accident" on board the aircraft. Though not defined by the Warsaw Convention or Montreal Convention,[238] the U.S. Supreme Court in *Air France v. Saks*[239] created a judicial determination of

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[233] *Id.*
[234] Paul S. Dempsey, *Private International Air Law Lecture Notes,* (Faculty of Law, McGill University, 17 October 2006).
[235] *International Air Transport Association: Agreement Relating to Liability Limitations of the Warsaw Convention,* DOT Order 95-2-44 (1995).
[236] Whalen, *supra* note 232.
[237] *Day v. Trans World Airlines*, 528 F.2d 31 (2d Cir. 1975), cert. denied 429 U.S. 890 (1976); *Buonocore v. Trans World Airlines, Inc.*, 900 F.2d 8 (2d Cir. 1990).
[238] Dempsey & Milde, *supra* note 207, at. 135.
[239] 470 U.S. 392, 105 S.Ct. 1338 (1985).

"accident" as an "unusual event or occurrence."[240] Although some other courts have tried to curtail this broad reading of accident,[241] most courts have held that the carrier is in the best position to control any risk or prevent any accident from occurring.[242] Therefore, qualification of an accident as "an unusual or unexpected event" and best subject to the control of the carrier continues to be embraced by most courts.[243]

Article 17 of the Montreal Convention has also been subject to much litigation over whether compensation sought was for a qualified "injury." While recovery for physical injury or "lesion corporelle" is fairly straightforward,[244] mental or emotional harm has been the subject of most debate.[245] Several courts have permitted "recovery for psychic damage accompanying physical injury"[246] and "recovery for mental anguish resulting from the occurrence of a bodily injury, the emotional distress being directly precipitated by the bodily injury being considered as a part of the bodily injury itself."[247] But the later case of *Jack v. Trans World Airlines* required compensation for mental recovery to *follow* a physical injury,[248] a finding later echoed in the *Terrafranca v. Virgin Atlantic* case requiring bodily injury to be a condition *precedent* to allow recovery for mental injury.[249] Courts have therefore taken a less favorable interpretation allowing recovery for emotional or psychic harm, short of some physical qualifiers (but perhaps extending to brain cell damage from post traumatic stress disorder).[250] In summary, the

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[240] Dempsey & Milde *supra* note 207, at 136.
[241] *Qantas Ltd. v. Povey*, [2003] VSCA 227, 2003 WL 23000693 (Dec. 23, 2003).
[242] Dempsey & Milde, *supra* note 207, at 142-43.
[243] *Id.* at 140-41.
[244] *Eastern Airlines v. Floyd*, 499 U.S. 530, 111 S.Ct. 1489 (1991).
[245] Dempsey & Milde, *supra* note 207, at 124-25.
[246] *In re Inflight Explosion on Trans World Airlines*, 778 F. Supp. 625 (E.D.N.Y. 1991).
[247] *Burnett v. Trans World Airlines*, 368 F. Supp. 1152 (D. N.Mex. 1973).
[248] 854 F. Supp. 654 (N.D.Cal. 1994).
[249] 151 F.3rd 108 (3rd Cir. 1998).
[250] *Weaver v. Delta Airlines*, 56 F. Supp. 2nd 1190.

Montreal Convention favors recovery for accidents causing physical injuries (including pain and suffering), but is facing a less sympathetic judicial trend for mental injuries even with physical manifestations. The ultimate evolution of Orbit Law may also favor some of these findings, coupled with the Montreal Convention's and Warsaw regimes' general application of the concept of *res ipsa loquitur* for determination of liability,[251] and will be further discussed in Chapter III.

C. Examination of the Fundamental Principles of Space Law Relevant to an Orbit Law Regime.

While the International Air Law treaties are more easily partitioned between issues of sovereignty (Paris/Chicago Conventions) and liability (Warsaw/Montreal Convention & their progeny), these two issues are not as easily split between the various Space Law conventions – sovereignty and liability are touched upon either directly or indirectly in each of the five founding Space Law treaties. Therefore, the assessment of each body of international Space Law will include summaries of those topics most relevant and beneficial to an orbital-based system of law, while Chapter III of this thesis will synthesize these summaries into practical proposals for the new Orbit Law regime.

1. Outer Space Treaty of 1967.

[251] Dempsey & Milde, *supra* note 207, at 137.

As a document which outlines the use and exploration of outer space "for the benefit and in the interests of all countries,"[252] the Outer Space Treaty can certainly be considered the "Constitution of outer space."[253] It should therefore not be surprising that many of its core principles outline the role of the State in international space affairs. State parties are considered to be the key actors when it comes to all space activities: "[S]tate Parties to the Treaty shall bear international responsibility for national activities in outer space...whether such activities are carried on by governmental agencies or by non-governmental entities...."[254] This same provision of the Treaty goes on to stipulate that "activities of non-governmental entities in outer space...shall require authorization and continuing supervision by the appropriate State Party to the Treaty."[255] Article VI of the Outer Space Treaty uses the term of art "appropriate State Party" [hereinafter "Appropriate State"] in its description of State responsibility, its legal connection to State liability based on the State's authority to control its private entities, and the State's ability to authorize or deny a private entity's space activities.[256] Article VII also uses a similar term of art when it describes "launching State" liability: "[E]ach State Party to the Treaty that launches or procures the launching of an object into outer space...and each State Party from whose territory or facility an object is launched, is internationally liable for damage...."[257] While these two concepts of State accountability are closely related, the four definitional qualifiers of the phrase "launching State" broadly extends liability from

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[252] Outer Space Treaty, *supra* note 9, art. I.
[253] Jakhu, *Developing Countries, supra* note 43, at 351.
[254] Outer Space Treaty, *supra* note 9 art. VI.
[255] *Id.*
[256] Armel Kerrest, *The Notion of Launching State in Light of Current Evolution of Space Activities*, PRESENTATION TO LEGAL SUBCOMMITTEE OF THE UNITED NATIONS COMMITTEE ON PEACEFUL USES OF OUTER SPACE, 36TH SESSION (2000).
[257] Outer Space Treaty, *supra* note 9, art. VII.

simply the "appropriate State" to a larger number of potential parties ("launching States").[258]

The term "launching State" is defined and clarified in both the Outer Space Treaty and the Liability Convention based on four possible categories of State involvement: a State which (1) launches or (2) procures the launching of a space object, or a State from whose (3) territory or (4) facility such object is launched.[259] Although the Liability Convention will be covered in more detail in the forthcoming paragraphs, Articles I and II of this Convention and Article VII of the Outer Space Treaty prescribe that international liability as a "launching State" can only be imposed on States and not private entities.[260] Such a scenario is problematic as more private entities are becoming fundamentally involved in the launching of space objects, thereby confounding which of the four categorical qualifiers implicates State connection as a "launching State."[261]

These four categories of State(s) participation also create the possibility that more than four launching States could be involved with the launch of a space object if "one State launches from the facility of another State which is in the territory of yet another State and if several States are considered to 'procure' the launching."[262] Furthermore, within each category there can be more than one State as well.[263] Nonetheless, a State only needs to fit into one of the four possible categories of launch involvement to qualify as a "launching State."[264]

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[258] *Id.*
[259] *Id.*; Liability Convention, *supra* note 144, art. I(c).
[260] von der Dunk, *supra* note 24, at 6.
[261] *Id.*
[262] K.-H. Bockstiegel, *The Term "Launching State" in International Space Law, in* 37TH COLLOQ. L. OUTER SPACE 80 at 81 (1994).
[263] Bin Cheng, *The 1972 Convention on International Liability for Damage Caused by Space Objects, in* STUDIES IN INTERNATIONAL SPACE LAW 286 at 308 (Bin Cheng ed., 1997).
[264] *Id.*

Private party liability, on the other hand, is typically governed by national laws; the launching State, the nationality of the private entity, or some other interested State determines which national laws apply.[265] Accordingly, the locus of liability is placed not solely on the (private) party causing the damage, but on the "[S]tate connected to the object by some tenuous link related to the launching."[266] But regardless of public or private action, a "[S]tate owes at all times a duty to protect other States against injurious acts by individuals from within its jurisdiction."[267] The extent of such State duty and responsibility was defined by Bin Cheng as:

> [A]nswerability for one's acts and omissions, for their being in conformity with whichever system of norms...as well as answerability for their consequences, whether beneficial or injurious. In law, it applies in particular to a person's answerability for compliance with his or her legal duties, and for any breaches thereof.[268]

Because States exercise authority over its private corporations, such jurisdiction imposes direct State "responsibility for any space activity that is within its legal power or competence to control, whether by governmental agencies or non-governmental entities."[269] Although the terms differ between Article VI and Article VII ("responsibility" versus "liability"), it remains clear that an "Appropriate State" under Article VI will remain accountable for violations of the Treaty or international law.[270]

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[265] Dimitri Maniatis, *The Law Governing Liability for Damage Caused by Space Objects: From State Responsibility to Private Liability,* 22-1 ANN. AIR & SP. L. 369 at 373 (1997).
[266] *Id.*
[267] *Trail Smelter Arbitration* (1949), 3 R Int'l Arb. Awards 1965-1966.
[268] Bin Cheng, *Article VI of the Space Treaty Revisited: "International Responsibility," "National Activities," and "The Appropriate State,"* 26-1 J. SPACE L. 7 at 9 (1998) [hereinafter *Article VI*].
[269] *Id.* at 23.
[270] Bin Cheng, *International Responsibility and Liability for Launch Activities, in* STUDIES IN INTERNATIONAL SPACE LAW 598 at 619 (Bin Cheng ed., 1997).

The rationale behind such extensive accountability is based upon the broad obligations of State's responsibility:

> In law, responsibility would mean therefore that, judged by legal norms, one is considered to be the author of a given act or omission, and to be the cause of all what, in law, are regarded as the consequences of that act or omission. One is consequently answerable for such action or omission being in conformity with the law, and also for its consequences....Legal responsibility entails a legal obligation incumbent on the author of the breach to make integral reparation to the victim for the damage so caused in order to restore the position to what it probably would have been had the breach not taken place.[271]

Article VI of the Outer Space Treaty creates a revolutionary expansion of traditional notions of liability by holding States strictly responsible for third party actions.[272] The concept of "Appropriate State" treats any act or breach by non-governmental entities as directly imputable to the State itself.[273] Private space activities are therefore equated to State activities regardless of any claim that the State acted with "due care."[274] Accordingly, it is this system of "responsibility" under Article VI rather than "liability" under Article VII which obligates States to authorize and supervise non-governmental space activities.[275] While non-governmental national (space) activities are not defined in the Outer Space Treaty, international law traditionally holds States responsible for activities over which they exercise jurisdiction and control.[276] The additional duties of an

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[271] *Id.* at 603.
[272] Cheng, *Article VI, supra* note 268, at 15.
[273] *Id.*
[274] von der Dunk, *supra* note 24, at 4.
[275] *Id.* at 9.
[276] *Id.* at 4.

Appropriate State require authorization and continuous supervision of the space activities of non-governmental entities, and a heightened responsibility and "extra vigilance" to oversee any private party space ventures.[277]

Financial backing and "procurement" of some portion of the mission under Article VII of the Outer Space Treaty is one area of increasing private-entity involvement in space activities. However, the entity "procuring" the launch may either be solely a State, or a private corporation qualifying its State of nationality as the launching State.[278] Determination of State procurement is often dependent upon the payload. Although there has yet to be any official determination ascribing exact meaning to "procure," it is typically believed to include private parties supplying the payload, producing the financial backing for the launch, or otherwise inducing a State to launch the space object.[279] Accordingly, "procurement" is commonly defined as "bringing about" by paying for the launch or making it happen by other means.[280] These definitions thereby incorporate State liability for private party launches; to otherwise allow States to escape accountability for otherwise "effectively allowing its private entities to bring about" a launch would circumvent the intent of the Outer Space Treaty, as well as the Liability Convention.[281]

It is becoming increasingly common for national licensing regimes to require liability insurance against third-party damage for space launches by private entities.[282] In other instances, States may require the private entity to demonstrate sufficient funds for

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[277] Cheng, *Article VI, supra* note 268, at 18.
[278] Armel Kerrest, *Launching Spacecraft from the Sea and the Outer Space Treaty: The Sea Launch Project*, 23-1 AIR & SPACE L. 16 at 19.
[279] Maniatis, *supra* note 265, at 383.
[280] von der Dunk, *supra* note 24, at 7.
[281] Bockstiegel, *supra* note 262, at 81-82.
[282] *Review of the Concept of the "Launching State,"* U.N. Committee for the Peaceful Uses of Outer Space, U.N. Doc. A/AC.105/768 at 10 (2002).

victim compensation in the event of an accident.[283] This escalating State concern may be partly based on the fact that "international responsibility" is not defined in the Outer Space Treaty.[284] However, it is logical to assume that "responsibility" would also entail "liability," because different translations of the Outer Space Treaty use the exact same word in either "equally authentic"[285] authoritative language. For example, the French translation of this text uses the word "responsabilité" for "responsible" in Article VI, while Article VII uses the word "responsible" in place of word "liable." The Spanish text reflects a similar interchangeable translation, citing "responsables" for "responsible" in Article VI, and "responsible" for "liable" in Article VII. Because these two official texts use language with identical meaning in either language ("responsibility" and "liability"), the Vienna Convention would support an interpretation that "appropriate State responsibility" naturally entails liability as well.[286]

A second topic of "constitutional" significance[287] within the Outer Space Treaty centers on the principle of "freedom of outer space."[288] As Article I outlines the parameters of exploration and use of outer space, it sets forth five requirements for legitimate employment of this arena. First, such use shall 1) "be carried out for the benefit and in the interests of all countries."[289] Therefore, one of the requirements for authorized use is that it stands to benefit others and is in the interest of other States. Such

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[283] *Id.*
[284] Outer Space Treaty, *supra* note 9, art. VII.
[285] *Id.* at art. XVII.
[286] "[W]hen a treaty has been authenticated in two or more languages, the text is equally authoritative in each language...." Vienna Convention on the Law of Treaties, May 22, 1969, 1155 U.N.T.S. 331, art. 33(1) [hereinafter Vienna Convention].
[287] Jakhu, *Developing Countries, supra* note 19.
[288] Outer Space Treaty, *supra* note 9, art. I.
[289] *Id.*

"international cooperation" includes governmental and non-governmental, commercial and non-commercial, global, multilateral, regional or bilateral efforts among all countries.[290] Promotion of these interests includes (a) the development of space science, technology and applications; (b) fostering the development of space capabilities; and (c) facilitating the exchange of expertise and technology.[291]

Continuing with the remaining four requirements in the second paragraph of Article I, "use" is also intended for all States 2) "without discrimination of any kind, on a basis of..." 3) "equality..." 4) "and in accordance with international law..." with 5) "free access to all areas of celestial bodies."[292] As long as any and all States have access to space, including the moon and other celestial bodies, on an equal basis, in accordance with international law, and without discrimination, States should be able to use these celestial areas without limitation.[293]

However, such freedom of use must also be in conformity with the principle of non-appropriation in Article II.[294] If space is a "common interest" and free for all States or persons to explore,[295] Article II's prohibition against claims of sovereignty is a logical application and extension of such freedoms. Although Article II specifically references "national" appropriation, the additional language "by any other means," combined with Article VI's encompassment of State responsibility for non-governmental entities, extends the application of non-appropriation to private parties.[296] To otherwise allow

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[290] U.N. G.A. Res. 51/122, Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries, U.N. Doc. A/51/590 (1996).
[291] *Id.*
[292] Outer Space Treaty, *supra* note 9, art. I.
[293] *Id.*
[294] *Id.* at art. II.
[295] *Id.* at preamble.
[296] *Id.* at arts. II, VI.

private appropriation would contravene the purpose of the Outer Space Treaty, starting with its very title "*Governing* the Activities of States in the Exploration and Use of Outer Space...."[297]

This right of all States to equally use and explore outer space is founded in the phrase "on the basis of equality" – sovereign equal footing under the U.N. Charter.[298] "Without discrimination of any kind" also enables "late comers" to space not to have their freedoms restricted or imposed upon by other States who may have previously orbited their own space objects.[299] Therefore, the very notion of State equality in space and the duty not to adversely interfere in the enjoyment of such rights by other States is founded in the parameters imposed by this Outer Space Treaty and "in accordance with international law, including the Charter of the United Nations."[300]

The prohibitions against claims of sovereignty do *initially* apply to States, because the customary Space Law dictating such application emerged from a combination of State practice and its later evolution into the Outer Space Treaty.[301] Customary State practice imposed State international responsibility and continuing supervision for "national activities" in outer space.[302] Such practices also formed part of customary international law almost immediately at the time of their enunciation in the General Assembly Resolution[303] in 1962; the Outer Space Treaty which emerged five years later was simply declarative of the existing international law.[304] Yet "national" activities cannot solely

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[297] Outer Space Treaty, *supra* note 9, title.
[298] Jakhu, *Satellite Imagery, supra* note 4, at 75.
[299] *Id.*
[300] *Id.*; Outer Space Treaty, *supra* note 9, art. III.
[301] Maniatis, *supra* note 265, at 375.
[302] *Id.*
[303] U.N. G.A. Res 1962 (XVIII).
[304] Ian Brownlie, PRINCIPLES OF PUBLIC INTERNATIONAL LAW, 3RD ED. 15 (Oxford: Oxford University Press, 1976).

mean official State activities, but instead refer to activities which have some special connection with the nation – whether carried on by the State itself or by non-governmental entities.[305] So although outer space is generally agreed to be the ultimate international arena with legal guidelines addressed primarily to States, private entities are nonetheless tied to this international legal framework for space activities.[306] Therefore, Article I's more permissive stance authorizing unfettered use of space, coupled with Article II's prohibition against claims of sovereignty or appropriation, are applicable to all users of space (be they public or private).

As these parameters of authorized space activities have highlighted, the air-space boundary embodies the inherent conflict between unencumbered outer space and State-sovereign airspace. On the one hand, sovereign equality and territorial integrity are central tenants of international law enunciated in the U.N. Charter.[307] "By sovereignty, we understand the whole body of rights and attributes which a State possesses in its territory, to the exclusion of all other States, and also in its relations with other States. Sovereignty confers rights upon States and imposes obligations on them."[308] Bin Cheng highlighted the importance of this spatial division of territories as:

> [T]he first and foremost problem on the minds of all States is the certainty, security and inviolability of their own frontiers, followed by a clear knowledge of the geographical limits of the others' legal powers – in other words, of everyone's competence *ratione loci*.[309]

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[305] Cheng, *Article VI, supra* note 268, at 20.
[306] von der Dunk, *supra* note 24, at 2.
[307] UN CHARTER, supra note 16, art. 2, ¶ 1.
[308] *Corfu Channel Case*, (Alb. v. U.K.) 1949 I.C.J. 4 at 43.
[309] Bin Cheng, *Nationality for Spacecraft? in* STUDIES IN INTERNATIONAL SPACE LAW 475 at 476 (Bin Cheng, ed., 1997) [hereinafter *Nationality for Spacecraft?*].

State sovereignty extends "to the internal waters and territorial sea of every State and to the air space above its territory"[310] – the same notion iterated by the ICAO Draft Brief to UNCOPUOS that same year.[311] Ian Brownlie echoed this point by stating "the law does not permit a right of innocent passage, even through the airspace over the territorial sea."[312] When coupled with the Air Law notions against innocent passage discussed in the previous section of this Chapter, these expansive prohibitions against flight are aptly suited for re-negotiation as the boundary between airspace and outer space slowly dissipates. Although a number of exceptions to the inviolability of State sovereignty have developed over the years, these caveats will be explored in Chapter III as justification for new Orbit Law guidelines. Otherwise these aforementioned areas of liability and sovereignty form the baseline of international accountability among States through the Outer Space Treaty, and will also serve as the lynchpin of change in the new Orbit Law methodology.

2. The Liability Convention of 1972.

While the Liability Convention shares similarities with the Outer Space Treaty, it also provides some additional guidance to the primary topic which bears its name ("Liability"), in addition to stimulating new, unanswered questions on this same subject. Referencing the same four categories as the Outer Space Treaty[313] ascribing State involvement, "[A] launching State shall be absolutely liable to pay compensation for

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[310] *Military and Paramilitary Activities* (Nicar. v. U.S.), 1986 I.C.J. 4 (June 27) at 101.
[311] *Draft Brief for the ICAO Observer*, *supra* note 92.
[312] Ian Brownlie, PRINCIPLES OF PUBLIC INTERNATIONAL LAW 115 (2003).
[313] Outer Space Treaty, *supra* note 9, art. VII.

damage caused by its space object on the surface of the Earth...,"[314] but is subject to fault-based liability for damage "caused elsewhere...to a space object...."[315] These two articles thereby create a two tier regime of liability contingent on the location of the damage – absolute liability on the Earth's surface or to aircraft in flight, and a negligence system for damage to space objects.[316] Unfortunately the Liability Convention and other space treaties do not define the term "space object;" drafters of the Liability Convention were unable to agree upon such a definition because of the age-old debate over the delimitation parameters of outer space.[317] However, even in the absence of a definition for "space object," the term "triggers the application of the Convention's liability rules."[318]

This is an important distinction for the launching State and its space object, because liability of a launching State is tied to the Liability Convention's definition of "damage caused by its space object" in Articles I and II. Such "damage" includes "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations."[319] Article II is also unique in imposing "absolute liability" on the launching State; though again not defined in the Convention, absolute liability typically refers to "liability that does not depend on actual negligence or harm, but that is based on

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[314] Liability Convention, *supra* note 144, arts. I, II.
[315] *Id.* at art. III.
[316] Maniatis, *supra* note 265, at 381.
[317] G. P. Zhukhov, *Definition and Classification of the Space Object: An Important Issue in International Law, in* LIBER AMICORUM HONOURING NICHOLAS MATEESCO MATTE: BEYOND BOUNDARIES 359 (Guido Rinaldi Baccelli ed., 1989).
[318] Frans G. von der Dunk, *The 1972 Liability Convention: Enhancing Adherence and Effective Application*, 41ST COLLOQ. L. OUTER SPACE 366 at 368 (1999).
[319] Liability Convention, *supra* note 144, art. I(a).

the breach of an absolute duty to make something safe."[320] The Convention later clarifies that such damages must be paid "in order to provide such reparation in respect of the damage as will restore the person...to the condition which would have existed if the damage had not occurred."[321] But despite the elaboration provided in this Convention, determinations of liability are far from conclusive as a consequence of this focus on the launch event.[322]

This liability can be distinguished from the responsibility/liability referenced as an "appropriate State" in the Outer Space Treaty.[323] While "[D]amage regarding liability is pretty well-defined in Space Law, damage as a component part of State responsibility for space activities, however, is not. It could include, in contrast to the former, other forms of immaterial damage, indirect damages, or even punitive damages."[324] Bin Cheng also noted that "failure to subject nongovernmental national space activities to authorization and continuing supervision would constitute an independent and separate cause of responsibility (than provided for in the Liability Convention)."[325]

A second distinction of the Liability Convention revolves around the uncertainty of *other* compensable events. It is clear that the Convention imposes liability when damage is physically caused by a space object's crash, explosion, or some other direct harm.[326] Whether other types of payment are authorized to ensure "a full and equitable

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[320] BLACK'S LAW DICTIONARY 934 (8th ed. 1999).
[321] Liability Convention, *supra* note 144, art. XII.
[322] von der Dunk, *supra* note 24, at 16.
[323] Outer Space Treaty, *supra* note 9, art. VI.
[324] Frans G. von der Dunk, *Liability Versus Responsibility in Space Law: Misconception or Misconstruction?*, 34TH COLLOQ. L. OUTER SPACE 363 at 367 (1991)
[325] Cheng, *Article VI, supra* note 268, at 13-14.
[326] Carl Q. Christol, SPACE LAW: PAST, PRESENT, AND FUTURE 219-20 (1991); Bruce A. Hurwitz, STATE LIABILITY FOR OUTER SPACE ACTIVITIES IN ACCORDANCE WITH THE 1972 CONVENTION ON INTERNATIONAL LIABILITY FOR DAMAGE CAUSED BY SPACE OBJECTS 12-20 (1992).

measure of compensation to victims" remains undecided.[327] For example, it is uncertain whether a client's lost revenues or other indirect damages are a compensable loss.[328] Some authors believe that loss of income is doubtful as a Liability Convention claim.[329] However, a number of scholars support a more liberal interpretation of damages. Bin Cheng asks us to "consider the appropriate reparation due to a fisherman whose fishing boat was illegally detained from the beginning to the end of the fishing season. To restore the *status quo ante*, it suffices to return the boat to him, but this would hardly make him whole again."[330] Pain and suffering are also damages which might be compensable "if the required causation were present and harm were experienced."[331] Von der Dunk noted that in deference to the World Health Organization's Constitution, "other impairment of health" would be interpreted broadly to enable recovery for mental and psychological injuries.[332] Such mental injuries "affecting mental health as well as other social well being" could therefore be a recoverable loss[333] -- potentially a more expansive interpretation of recovery contrary to decisions in the International Air Law system and the Montreal Convention of 1999 discussed earlier in this chapter.

The harshness of potential absolute liability in Article II is not met with any limitation on liability, but only with provisions for exoneration.[334] Maniatis argues that this system should be more accurately described as one of strict liability, because a

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[327] Liability Convention, *supra* note 144, preamble.
[328] Thomas Beer, *The Specific Risks Associated with Collisions in Outer Space and the Return to Earth of Space Objects – the Legal Perspective*, 25 AIR & SPACE L. 42 at 48 (2000).
[329] von der Dunk, *supra* note 24 at 17.
[330] Bin Cheng, *The 1972 Convention on International Liability for Damage Caused by Space Objects, in* STUDIES IN INTERNATIONAL SPACE LAW 286 at 335 (Bin Cheng ed., 1997).
[331] Carl Q. Christol, *International Liability for Damage Caused by Space Objects,* 74 AM. J. INT'L L. 346 at 359 (1980).
[332] von der Dunk, *supra* note 24, at 16.
[333] Stephen Gorove, *Cosmos 954: Issues of Law and Policy*, 6 J. SPACE L. 137 at 140 (1978).
[334] Maniatis, *supra* note 265, at 381.

launching State may be exonerated to the extent that they can establish "that the damage has resulted either wholly or partially from gross negligence or from an act or omission done with intent to cause damage on the part of a claimant State...."[335] However, the launching State still bears the burden of proving gross negligence or willful misconduct by the claimant State.[336] In the absence of any exoneration, compensation is potentially unlimited amounting to *restitution in integrum*, either in fact or in financial value.[337]

Recovery by private party victims is uncertain under the Convention because Articles XIV through XX provides the *modus operandi* for State-to-State affairs, with States being the exclusive liable entities and exclusive claimants.[338] Private entities seeking recovery are therefore dependant upon national legislation, and might not receive obligatory compensation even if their State takes up their claim.[339] Because the subject of liability is such an important issue for private enterprise, the Liability Convention retains significant shortcomings in addressing private party involvement in space activities.[340] Substantial harmonization of liability implementation might establish a more level playing field in the increasing era of private party space involvement.[341]

Although the remaining space treaties address issues somewhat more peripheral to the primary concerns of a new Orbit Law regime (i.e. liability and sovereignty), the remaining sections in this chapter will still highlight those items relevant to the new system.

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[335] *Id.*
[336] *Id.*
[337] von der Dunk, *supra* note 24, at 17.
[338] *Id.* at 19.
[339] *Id.*
[340] *Id.*
[341] *Id.*

3. The Registration Convention of 1975.

In accordance with Article I of the 1975 Registration Convention, contracting States bind themselves to register space objects if they fall under the definition of "launching State."[342] These requirements stem from corresponding language in the Outer Space Treaty: "[a] State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body."[343] This quasi-territorial jurisdiction of the State of registration thereby overrides any claims of personal jurisdiction for the craft and its personnel.[344] Retention of such "jurisdiction and control" by the State of registration is another key component in the liability equation, as these activities are considered that State's "national activities" for which they are internationally responsible under Article VI of the Outer Space Treaty.[345] The effectiveness of this State jurisdiction and control is heightened through the Convention's obligation to also establish and maintain a *national* register in addition to its other registration requirements.[346] National registration provides a means for the State of registry to legally control its space objects, personnel, and activities which may incur

[342] Convention on Registration of Objects Launched into Outer Space, 1023 U.N.T.S. 15, 12 Nov. 1974, art. I [hereinafter Registration Convention].
[343] Outer Space Treaty, *supra* note 9, art. VIII.
[344] Imre Anthony Csabafi, THE CONCEPT OF STATE JURISDICTION IN INTERNATIONAL SPACE LAW 103 at 113 (1971).
[345] Cheng, *Article VI*, *supra* note 268, at 20.
[346] Registration Convention, *supra* note 342, art. II(1).

responsibility and/or liability at the international level.[347] Accordingly, registration is one additional factor to help in the determination of State responsibility.

Per the terms of the Convention, only a launching State can be a State of registry;[348] it is not possible for non-launching States to register a spacecraft.[349] But while the State of registry is internationally responsible under Article VI of the Outer Space Treaty, registration is not the only criterion, as other States might also be internationally responsible.[350] Nonetheless, a launching State which elects to register a space object does incur potential liability and responsibility as well, as that State possesses the means to legally control the space object through its explicit jurisdiction over such objects.[351] Accordingly, it has been registration and not nationality that has been chosen as the link establishing a State's jurisdiction over a space object.[352]

Problems with jurisdiction versus actual control and responsibility for space objects continue to surface with increasing privatization of space activities. One example of such complications which emerged from a change in registration of space objects occurred with the transfer of AsiaSat 1, Apstar-1 and Apstar-1A from the United Kingdom to China.[353] Although China was one of the original launching States when these satellites were launched from its territory, the UK as the original State of Registry must keep these satellites under its jurisdiction and control, even though it no longer has the practical capacity to do so.[354] Had the transfer of satellites occurred to a non-launching State, the new State would not be liable under the Outer Space Treaty and

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[347] von der Dunk, *supra* note 24, at 20.
[348] Registration Convention, *supra* note 342, art. II.
[349] Armel Kerrest, *Remarks on the Notion of Launching State*, 42ND COLLOQ. L. OUTER SPACE 308 (1999).
[350] Cheng, *Article VI, supra* note 268, at 22, 27.
[351] von der Dunk, *supra* note 24, at 16.
[352] Cheng, *Nationality for Spacecraft? supra* note 309, at 483.
[353] Kerrest, *supra* note 349, at 309.
[354] *Id.*

Liability Convention, and technically it could not become a State of Registration under the Registration Convention because only a launching State can register the object.[355] The emergence of Reusable Launch Vehicles (RLV's) would seem to necessitate the registration and treatment of each new launch as an actual space launch, based on current application and interpretation of the Registration Convention.[356] But the quasi-territorial criterion of such launches and craft, coupled with their increasingly commercial and multi-national character, makes both the registration of the platforms and determination of the "launching State" extremely difficult.[357] Modifications to the Registration Convention must be considered which will enable new States to exert jurisdiction and control over transferred space objects.[358] Such action would protect the original State of registry from any unlawful action by the new State or its private entity owning and using the satellite.[359] One proposal might be to enable a non-original launching State to register a spacecraft.[360] This change would enable the non-launching State to become liable through its own recognition of responsibility, and would also enable the deployment of RLV's from multiple territories without those States incurring the full brunt of potential liability as a launching State.[361] The practicality of such application to the Orbit Law regime will be discussed in Chapter III.

4. The Rescue & Return Agreement of 1968.

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[355] *Id.*
[356] *Id.* at 310.
[357] *Id.*
[358] *Id* at 309.
[359] *Id.*
[360] *Id.*
[361] *Id.* at 309-310.

The provisions of the Rescue & Return Agreement[362] embody the spirit of international cooperation in space activities, and will play an important role in the implementation of a successful Orbit Law system. While the Rescue Agreement deals not so much with space activities *per se*, its primary focus is on the particular consequences thereof, with a special emphasis on safety aspects of space travel as opposed to status, security or liability.[363] The establishment of policies to ensure the speedy return of spacecraft and its personnel to the State of nationality is deeply rooted in the development of international Space Law.[364] As early as 1959, the U.N. Ad Hoc Committee on Peaceful Uses of Outer Space expressed "the desirability of the conclusion of multilateral agreements concerning re-entry and landing, such agreements to contain suitable undertakings on co-operation and appropriate provisions on procedures" ensuring the fundamental right of States to demand the return of spacecraft and its personnel.[365] These proposals were also founded in existing international law and State practice of mutual cooperation between States whose aircraft were involved in an accident, and the State of impact.[366]

Much of the emphasis of the Rescue & Return agreement is rooted in the special status afforded to the personnel of spacecraft. The esteemed designation of "astronaut" was founded in Article V of the Outer Space Treaty, and tolls the requirements of special assistance to these travelers in the event of distress or emergency: "[S]tates Parties to the Treaty shall regard astronauts as envoys of mankind in outer space and shall render to

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[362] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 672 U.N.T.S. 119, 22 Apr. 1968 [hereinafter Rescue & Return Agreement].
[363] von der Dunk, *supra* note 24, at 16.
[364] McDougal, Lasswell & Vlassic, *supra* note 21, at 523-25.
[365] *Id.*
[366] *Id.*

them all possible assistance in the event of accident, distress, or emergency landing on the territory of another State party or on the high seas."[367] Concurrent language is found in Article 2 of the Rescue & Return Agreement, reinforcing the necessity of States to "immediately take all possible steps to rescue them and render them all necessary assistance."[368] This emphasis is not surprising, as rescue operations involving human life are given special attention and so reflected in the space treaties.[369]

However, the Rescue & Return Agreement also appears to expand this important distinction to all "personnel of a spacecraft,"[370] as the term "astronauts" is nowhere defined in the Agreement, Outer Space Treaty, or any of the other space treaties. The personnel of a spacecraft in need would be entitled to all feasible help and support from any relevant State, wherever it would find itself, and such personnel would have a right to safe and expeditious transport to their home State.[371] Therefore, any space traveler in need of assistance should be afforded such aid and promptly repatriated to the launching authority,[372] or their State of citizenship.[373] There are no caveats for the return of astronauts under either the Outer Space Treaty[374] or the Rescue & Return Agreement:

> If, owing to accident, distress, emergency or unintended landing, the personnel of a spacecraft land in territory under the jurisdiction of a Contracting Party or have been found on the high seas or in any other place not under the jurisdiction of any

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[367] Outer Space Treaty, *supra* note 9, art. V.
[368] Rescue & Return Agreement, *supra* note 362, art. 2.
[369] Bryan Schwartz & Mark L. Berlin, *After the Fall: An Analysis of Canadian Legal Claims for Damage Caused by Cosmos 954*. 27 MCGILL L.J. 676 at 703 (1982).
[370] *Id.* at arts. 1, 2, 3, 4.
[371] von der Dunk, *supra* note 24, at 16.
[372] *Id.* at art. 4.
[373] *Nottebohm*, Second Phase (Liech. v. Guat.), 1955 I.C.J. 4 (Apr. 6).
[374] Bin Cheng, *The 1968 Astronauts Agreement, in* STUDIES IN INTERNATIONAL SPACE LAW 265 at 271 (Bin Cheng, ed., 1997).

State, they shall be safely and promptly returned to representatives of the launching authority.[375]

Although the Rescue & Return Agreement provides a somewhat circular definition for "launching authority" as "the State responsible for the launching,"[376] a State where a space object and/or its personnel lands is nonetheless obligated to return them to the "launching authority" under Article 5.[377] Responsibility for such space objects is somewhat clarified in Article VIII of the Outer Space Treaty, which provides for the return of a space object to the "State of registry"[378] – also known as the launching authority or "launching State" under the Registration Convention.[379] However, the Rescue Agreement itself avoids any reference to registration of space objects, as well as nationality, and instead only provides for the return of such space objects or astronauts to this nebulous "launching authority."[380] This lack of clarification may be due in part because the Rescue Agreement is the first multilateral U.N. treaty relating to space to recognize the possible independent legal existence of *international organizations* (as opposed to States) engaged in space activities (Article 6).[381] Although this thesis will not focus on the nuances and qualifiers of a "launching authority," the emphasis remains on the rescue & return of its craft and personnel. In any case, the special value afforded such travelers and the extensive assistance and protections mandated to such flights must convey to the new Orbit Law system. But these provisions are also ripe for expansion –

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[375] Rescue & Return Agreement, *supra* note 362, art. 4.
[376] *Id.* at art. 6.
[377] Bin Cheng, *Nationality for Spacecraft?, supra* note 309, at 485.
[378] Outer Space Treaty, *supra* note 9, art. VIII.
[379] Registration Convention, *supra* note 342, art. I.
[380] Cheng, *Nationality for Spacecraft? supra* note 309, at 483.
[381] *Id.*

to ensure a broad enough legal structure so that all instances of distress are quickly remedied regardless of suborbital or orbital location.

5. The 1979 Moon Agreement.

At the present time, analysis of the Moon Agreement[382] and its limited legal status remains a purely theoretical exercise in light of the small handful of States who have signed or ratified it.[383] However, examination of this Agreement and comparison of its principles to those contained in the Outer Space Treaty may provide useful guidance on the extent of authorized *use* of outer space, including the Moon & other celestial bodies. Preamble language of the Moon Agreement States that the four preceding space treaties must be taken into account "to define and develop the provisions of these international instruments in relation to the moon and other celestial bodies, having regard to further *progress* in the exploration and *use of outer space*...."[384] Article 1 of the Moon Agreement also dictates that "[T]he provisions of this Agreement relating to the moon shall also apply to other celestial bodies within the solar system...*except* in so far as *specific* legal norms enter into force with respect to any of these celestial bodies."[385] The remainder of the Moon Agreement then proceeds to specifically discuss limitations and guidance for use of the Moon, but not any other celestial bodies. In the absence of these aforementioned "specific legal norms" or new legal regimes, the language of Article 1[386]

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[382] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 1363 U.N.T.S. 3, 18 I.L.M. 1434, 18 Dec. 1979 [hereinafter Moon Agreement].
[383] von der Dunk, *supra* note 24, at 20.
[384] Moon Agreement, *supra* note 382, preamble (emphasis added).
[385] *Id.* at art. 1 (emphasis added).
[386] *Id.* at art. 1(1).

and the Preamble reference application of the Outer Space Treaty and other space treaties as the appropriate tomes regulating the use of all other celestial bodies. "Use" of outer space and all other celestial bodies must therefore follow the broader mandates of the Outer Space Treaty and other treaties; the language of the Moon Agreement otherwise only dictates the use and exploitation of this resource – the Moon itself.

The Moon Agreement's fundamental provisions evolve from its accepted status as *terra communis* as following from the general status of outer space.[387] It also repeats the non-appropriation clause of Article II of the Outer Space Treaty almost word-for-word, while extending the "common heritage of mankind" principle to the Moon and its natural resources.[388] Although the similar language "province of all mankind" in the Outer Space Treaty and Moon Agreement would seem to allow private and/or commercial exploitation and use under the *terra communis*-status, most authors agree that the "common heritage" principle does allow such exploitation, but in accordance with the remainder of the Agreement.[389]

The author believes that the importance of these provisions is found in their applicability to the Moon, but not to the rest of outer space or other celestial bodies. The restrictive doctrine regarding use and exploitation should not be extended beyond the parameters of the Moon as outlined in its Agreement. Accordingly, the tenants of freedom of use and exploration of space and its *other* celestial bodies espoused in the Outer Space Treaty[390] prevail and remain solid legal guidance for current Space Law and the future Orbit Law regime.

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[387] von der Dunk, *supra* note 24, at 20.
[388] *Id.* at 20-21.
[389] *Id.* at 22.
[390] Outer Space Treaty, *supra* note 9, art. I.

The prominence of liability and sovereignty underscored in this Chapter emphasize the importance of these two major issues which are common to both airspace and outer space. These matters will also serve as the springboard for Chapter III's innovations to unite the separate airspace and outer space legal disciplines across *all* boundaries of flight. But before progressing into the common traits of suborbital and orbital flights which necessitate the transition to Orbit Law, Chapter II will feature the technology which has prompted the pressing need for such legal changes, and highlight proposals demanding a unified structure for all flight safety.

CHAPTER II

ADVANCES IN TECHNOLOGY – CURRENT & FUTURE DEVELOPMENTS NECESSITATING A NEW LOOK AT AIR & SPACE LAW

Current improvements in technology are literally reaching new heights in suborbital and orbital flight. The U.S. Space Shuttle program of the 1980's and 1990's pioneered numerous advancements in orbital technology through the development of the first operational Reusable Launch Vehicle (RLV).[391] But like most space flights of the previous three decades, the Shuttle program was a State endeavor largely beyond the reach of exploitation by businesses, industry or private interests. Faced with increased costs and a desire to share and spread the efforts of space utilization, the U.S. government ultimately elected to move much of its government-developed technology into the private sector in an effort to "encourage to the maximum extent possible the fullest commercial use of space."[392] Beginning in the 1980's and augmented through the 1990's, these changes in laws and policies enabled increased commercialization of space and signified the end of sole-State action in outer space.[393] With it has come a marked upsurge in private development and commercial application of RLV technology, with the goal of easier access and use of outer space.[394] While the Shuttle was the first craft designed to perform in both an air and space arena, the seminal event in the commercial development

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[391] Richard L. Witkin, "Shuttle Meets Need for Reusable Craft that Could Also Serve Military's Ends" *New York Times* (10 April 1981) A18.
[392] Richard M. Obermann & Ray A. Williamson, *Implications of Previous Space Commercialization Experiences for the Reusable Launch Vehicle*, SPACE POLICY 14 (1998).
[393] *Id.* at 22-23.
[394] Susan J. Trepczynski, *Edge of Space: Emerging Technologies, The "New" Space Industry, and the Continuing Debate on the Delimitation of Outer Space* (2006) (unpublished LL.M. thesis, Institute of Air & Space Law, McGill University).

of such hybrid craft occurred with the successful launch of *SpaceShipOne* on 04 October 2004.[395]

A. Trends & Developments in Technology and Activities.

SpaceShipOne symbolized a huge stanchion in bridging the gap between air and space, as well as making outer space an attainable goal of the private sector, as it was the first craft entirely constructed and financed by private industry to reach outer space.[396] The brainchild of Burt Rutan and his company Scaled Composites, this hybrid craft achieves takeoff and landing like a conventional aircraft, but also utilizes hybrid rocket engines for the final boost from airspace to outer space.[397] Capturing the $10 million Ansari X-Prize by creating a craft capable of carrying three personnel, and launching it to a height of over 100 km twice in two weeks, this event has inspired numerous other companies in their private pursuit of air and space flight.[398] The Ansari X-Prize Foundation credits this event with "chang(ing) the way the public perceives spaceflight. The revolutionary *(sic)* surpassed our highest expectations, creating significant developments in the personal spaceflight industry even before the Ansari X PRIZE was awarded."[399]

Following this successful hybrid mission, a partnership between Scaled Composites, Mojave Aerospace Ventures (the corporation which owned the technology

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[395] Scaled Composites, LLC, "SpaceShipOne Captures X-Prize," online: Scaled Composites, LLC <http://www.scaled.com/projects/tierone/041004_spaceshipone_x-prize_flight_2.html>.
[396] Michael A. Dornheim, "SpaceShip Won; FAA Administrator Hints Spaceships May Be Treated Like Experimental Aircraft" *Aviation Week & Space Technology* 161:14 (11 October 2004) 34.
[397] Scaled Composites, *supra* note ## at *Frequently Asked Questions – General.*
[398] X-Prize Foundation, "Ansari X-Prize," online: X-Prize Foundation <http://www.xprize.org/xprizes/ansari_x_prize.html>.
[399] *Id.*

designed by Scaled Composites) and Virgin Group's subsidiary Virgin Galactic was announced, creating a new company called The Spaceship Company.[400] The new company will design *SpaceShipTwo* and the *White Knight Two* launch systems to support a craft capable of commercial passenger operations.[401] Virgin Galactic will thereby position itself to become the world's first space tourism operator, with flights projected to be offered some time in late 2007.[402]

A number of other private entities are well into their own development of craft with similar capabilities. One company includes SpaceDev, Inc. and their "*Dream Chaser RLV*," which is currently scheduled to undergo manned *suborbital* test flights in 2008, with *orbital* test flights planned for 2010.[403] Interestingly it was SpaceDev's hybrid rocket motor technology which successfully launched *SpaceShipOne* on its flight in 2004.[404] The company is also heavily invested in the "design, manufacture, marketing, and operation of sophisticated micro and nano satellites, hybrid rocket-based orbital Maneuvering and orbital Transfer Vehicles (MoTVs), as well as safe suborbital and orbital hybrid rocket based propulsion systems," and has recently partnered with United Launch Alliance to use the *Atlas V* rocket as the likely launch platform for the *Dream Chaser RLV*.[405]

Space Adventures, Ltd. is another company actively developing suborbital and orbital craft for commercial use, private orbital missions to the International Space

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[400] Scaled Composites, *supra* note 395, at <http://www.scaled.com/projects/tierone/092704_scaled_paul_allen_virgin_galactic.htm >.
[401] *Id.* at <http://www.scaled.com/news/2005-07-27_branson_rutan_spaceship_company.htm>.
[402] Scaled Composites, *supra* note 10.
[403] SpaceDev, Inc., *Missions*, "SpaceDev's Dream Chaser" online: SpaceDev, Inc. <http://www.spacedev.com/newsite/templates/subpage2_article.php?pid=542>.
[404] *Id.*
[405] *Id.* at *News, 10 Apr 2007.*

Station, and ultimately lunar missions.[406] Offering prospective clients "the unique opportunity to participate in the historic birth of the commercial space travel industry and to help build the foundation for future generations of explorers," Space Adventures Ltd. has partnered with the Federal Space Agency (FSA) of the Russian Federation for use of their *Soyuz* spacecraft for many of its launches, while they also continue to develop the suborbital spacecraft *Explorer*.[407] It is interesting to note that as part of their proposed lunar mission, Space Adventures plans an orbital rendezvous with a rocket booster to join with the manned spacecraft and provide the necessary additional boost for the flight to the Moon.[408] This mission thereby combines both orbital and inter-orbital components of flight during its launch to low Earth orbit, and subsequent booster-assisted transfer to lunar orbit. As Chapter III will further explain, despite the differences between these two flights (orbital and inter-orbital), they may both be subject to similar legal applications in an Orbit Law system.

Another of Space Adventures partners includes their contract with the company XCOR to eventually utilize the suborbital craft *Xerus* currently under development.[409] Additional XCOR *Xerus* missions may include suborbital payloads and microsatellite delivery.[410] As highlighted in Chapter III, these two missions (suborbital payloads versus microsatellite delivery) could be subject to *different* legal applications depending upon the duration of the mission and its true orbital status. The U.S. government has also taken an interest in *Xerus'* development, with the awarding of an Air Force RLV Design

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[406] Space Adventures, Ltd., *Suborbital Spaceflight; Orbital Spaceflight; Lunar Mission* online: Space Adventures, Ltd. <http://www.spaceadventures.com/index.cfm>.
[407] *Id.*
[408] *Id.*
[409] XCOR Aerospace, *Xerus Single Stage Suborbital Vehicle,* "General Questions" online: XCOR Aerospace <http://www.xcor.com/products/vehicles/xerus_faq.html>.
[410] *Id.*

Contract to analyze the rocket-powered vehicle with "relevance to space lift and other military requirements."[411] The significance of military applications to suborbital and orbital flights will be analyzed later in this chapter.

Another firm reportedly designing a similar suborbital craft to the *Xerus* includes the company Rocketplane, Inc.[412] Its *XP Suborbital Spaceplane* is scheduled to begin test flights in 2009, while the company is also developing the *K-1* reusable aerospace vehicle.[413] With the *K-1* being designed to "become the reliable, low-cost provider of launch services for commercial, civil, and military payloads destined for Low Earth Orbit (LEO), Medium Earth Orbit (MEO) and Geosynchronous Earth Orbit (GEO), as well as to and from the International Space Station (ISS)," Rocketplane and its subsidiary Rocketplane Kistler is poised to refine the "commercial space transportation services for passengers and cargo through its fleet of highly reliable, cost effective, and reusable aerospace vehicles."[414] "In addition to cost reductions, the *K-1* vehicle brings other benefits to customers. With its quick turnaround time, the *K-1* introduces launch-on-demand service, eliminating schedule constraints that often affect time-sensitive businesses or missions. Existing space transportation customers will also enjoy significant reductions in insurance premiums resulting from the continual use of the same proven vehicle. Rocketplane Kistler expects to eventually approach the cost of aircraft insurance as experience accumulates."[415] The author hopes that the proposals of Orbit

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[411] *Id.* at <http://www.xcor.com/press-releases/2007/07-04-10_Air_Force_Awards_RLV_Design_Contract_to_XCOR_Aerospace.html>.
[412] Rocketplane, The Future of Commercial Space Transportation, "About Rocketplane" online: Rocketplane, Inc. < http://www.rocketplane.com/about.htm>.
[413] *Id.*
[414] *Id.*
[415] *Id.*

Law will further enable the predictions made by this company, especially concerning the issues of liability and insurance premiums.

Rocketplane, Inc. has also joined with Incredible Adventures in their effort to enter into the burgeoning space tourism industry.[416] In a rather humorous quote discussing the issues confronting the development of space tourism, Incredible Adventures company president Jane Reifert Stated at the 2005 Space Technology & Applications International Forum (STAIF), "[M]arketing space will not be easy. Fun haters are everywhere. Most of them are lawyers, insurance agents and government officials. Anyone marketing space to civilians must be prepared to meet obstacles."[417] Perhaps the streamlined approach of Orbit Law will negate the perception that regulation of space will automatically present an obstacle to its use and development. "Deregulation" in and of itself does not mean fewer rules or less government control, but rather it facilitates competition in private industry and enables companies to operate under fair conditions.[418] The proposals of Orbit Law seek to modernize issues of liability and insurance coverage, simplify sovereignty and overflight concerns, and structure safety standards for suborbital and orbital flights; it does not wish to hamper private industry.

The company Blue Origin is also developing a suborbital vehicle as part of their program titled "New Shepard," a "vertical take-off, vertical-landing vehicle designed to take a small number of astronauts on a sub-orbital journey into space."[419] On 13

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[416] Leonard David, "Have Spaceplane Will Travel" *Space.com* (24 February 2005), online: Space.com <http://www.space.com/businesstechnology/technology/rocketplane_050224.html>.
[417] *Id.*
[418] Ram S. Jakhu, *Space Law: General Principles Lecture Notes*, (Faculty of Law, McGill University, 11 September 2006).
[419] Blue Origin, "Development Flight, and We are Hiring" online: Blue Origin <http://public.blueorigin.com/index.html>.

November 2006, the *Goddard*, a first development vehicle in the New Shepard program, had a successful test launch and landing and achieved an altitude of 285 feet using its advanced cryogenic engines.[420] Though little additional information was available on this program, New Shepard represents one of the many alternate technologies, propulsion systems, and methods being employed to attain suborbital flight, and is also a likely indicator that private industry will continue to lead the way in these developments.

In conjunction with the space tourism industry, but subject to different considerations than suborbital and orbital *launch vehicles* previously discussed, are the emerging technologies in orbital habitats. On 12 July 2006, Bigelow Aerospace successfully launched its *Genesis I* inflatable space module into low Earth orbit.[421] Although an unmanned module, *Genesis I* provided extensive data on the functional success of expandable modules in space.[422] As corporate counsel Robert Gold Stated following *Genesis I*'s successful launch and deployment, "[Y]ou see a lot of Power Point slides and pretty pictures of inflatable habitats in the literature, but, the fact of the matter is...an expandable system has never been tested in an actual orbital environment. No real data currently exists, and hopefully, the *Genesis-I* mission can help change this situation dramatically."[423] In a joint project with Lockheed Martin, Bigelow is examining the feasibility of using the *Atlas V* to deliver personnel to these space habitats. Although *Genesis I* and *II* are primarily experimental and not capable of supporting low Earth orbit tourism, subsequent modules including the *Sundancer* and *BA-330* will be designed and "equipped with life support systems, attitude control, three windows, on-orbit

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[420] *Id.*
[421] Leonard David, "Exclusive: Bigelow Orbital Module Launched Into Space" *Space.com* (12 July 2006), online: Space.com < http://www.space.com/missionlaunches/060712_genesis-1_launch.html>.
[422] *Id.*
[423] *Id.*

maneuverability, reboost and de-orbit capability," and represent long-term assets intended to remain in orbit for a number of years.[424] These orbital habitats should not be confused with the development of other similar platforms known as High Altitude (or Stratospheric) Platforms (HAPS), which are essentially hovering structures proposed for operation in the "near space" just below what could be considered outer space, yet above altitudes traditionally employed by aircraft.[425] Operating at a range between approximately 20 kilometers and 99 kilometers above sea level,[426] these structures are designed to maintain its location above a specific area of the Earth's surface over a multi-year lifetime.[427] The benefit of such platforms is expected to be seen in numerous areas, including such uses as heavy cargo airlift and communication stations.[428] But for true space habitats, even though at present there are "no commercially available spacecraft designed to take humans into orbit....*Sundancer* will, in effect, be a destination waiting for a means to get there...,"[429] the current trend of orbital technology slightly outpacing launch capabilities is likely short-lived. Accordingly, a legal regime which also governs these orbital structures, and not just the craft which deploys or services them, must necessarily be considered.

Revolutions in flight and propulsion technology are emerging on a daily basis. The European Space Agency and Australian National University recently announced

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[424] Warren Ferster, "Private Space Habitat Could Launch by 2010" *Space.com* (21 September 2006), online: Space.com <http://www.space.com/news/060921_bigelow_plans.html>.
[425] Leonard David, "Sky Trek to the 'Near Space' Neighborhood" *Space.com* (09 November 2005), online: Space.com <http://www.space.com/businesstechnology/051109_airships.html>.
[426] *Id.*
[427] Martine Rothblatt, *Are Stratospheric Platforms in Airspace or Outer Space?*, 24 J. SPACE L. 107 (1996).
[428] David, *supra* note 425.
[429] Ferster, *supra* note 424.

breakthroughs and successful testing in the early development of an ion engine.[430] Hypersonic aircraft are also an emerging field of flight offering affordable, rapid and reliable spacelift capabilities by flying payloads to the upper limits of the Earth's atmosphere and then launching them into orbit using small rocket boosters. Australian HyShot Projects I-V scored successful tests over the past several years in conjunction with British company QinetiQ and the Japanese Space Agency (JAXA).[431] The U.S. Air Force is also entering the foray in its collaboration with Australia for further hypersonic technology development called Hypersonic International Flight Research Experimentation (HiFIRE).[432]

U.S. Government efforts to advance air-breathing hypersonic flight were primarily seen in NASA's X-43 aircraft, and the U.S. Air Force's X-51A.[433] As supersonic combustion ramjet technology continues to improve, including the scheduled development and testing in 2009 of Hypersonic Technology (HyTech) scramjet engines using endothermic hydrocarbon fuel in a vehicle capable of attaining speeds exceeding Mach 7.0+,[434] the ability of such "aircraft" to reach sufficient altitude and speed for suborbital flights will become more commonplace.

As suborbital and orbital flight becomes easier to attain, one must also consider the influence of supplementary technologies being developed to maximize this increased

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[430] European Space Agency, *Press Release*, "ESA and ANU Make Space Propulsion Breakthrough" (13 January 2006), online: ESA <http://www.esa.int/techresources/ESTEC-Article-fullArticle_par-28_1134728785014.html>.

[431] University of Queensland, *News Release*, "Hyshot Scramjet Experiment Blasts Off in South Australian Desert" (25 March 2006), online: The University of Queensland <http://www.uq.edu.au/news/index.html?article=9258>.

[432] Air Force Research Laboratory, *News Release*, "Multi-National Agreement to Advance High-Speed Flight" (14 November 2006), online: Spaceflight Now <http://spaceflightnow.com/news/n0611/14hifire/>.

[433] Globalsecurity.org, *Military Systems Aircraft*, "X-51 Scramjet Engine Demonstrator - WaveRider (SED-WR)" online: Globalsecuirty.org < http://www.globalsecurity.org/military/systems/aircraft/x-51.htm>.

[434] *Id.*

access to space. One such advancement includes Microsatellite Technology Experiments (MiTEx), which are being considered for a variety of functions including defense applications[435] and proximity operations around GEO satellites.[436] On-orbit servicing of satellites is another similar function that these smaller, easily-launched payloads can perform.[437] The U.S. Defense Advanced Research Projects Agency (DARPA) is engineering the *Astro* service craft for on-orbit applications such as inspections, repairs, refueling and other satellite service features.[438] Small Launch Vehicles (SLVs) are also being cultivated by DARPA and the U.S. Air Force Falcon project, and will be capable of placing small payloads into LEO with minimal notice and expense.[439] Russia[440] and China[441] are also each designing systems to launch microsatellites using rocket boosters carried by modified military aircraft. With each different scenario of suborbital or orbital deployment, Orbit Law will analyze and determine the appropriate legal applications for these varying flights.

Re-entry space vehicles require additional consideration of the application of Air and Space Law to these uniquely-functional craft. Although U.S. plans for an "Orbital

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[435] Justin Ray, "Delta II Rocket Puts Military Experiment Into Space," *Spaceflight Now* (21 June 2006), online: Spaceflight Now <http://spaceflightnow.com/delta/d316/>.
[436] Jeremy Singer, "Critics Worry There May Be More to MiTEx than Meets the Eye," *Space News* (05 July 2006), online: Space News <http://www.space.com/spacenews/archive06/Mitex_070306.html>.
[437] Michael Dornheim, "Service Express" *Aviation Week & Space Technology* (05 June 2006) at 46-50.
[438] Defense Advanced Research Projects Agency, "Orbital Express Space Operations Architecture" (08 August 2006), online: DARPA <http://www.darpa.mil/tto/programs/oe.html>.
[439] Brian Berger & Jeremy Singer, "Field Narrows for DARPA's Falcon Program; Decision Expected Soon" *Space.com* (29 August 2005), online: Space.com <http://www.space.com/spacenews/archive05/Falcon_082905.html>.
[440] Yuri Zaitsev, "Russia and Kazakhstan to Develop Unique Space System" Spacewar (21 May 2006) online: SPACEWAR.com <http://www.spacewar.com/reports/Russia_And_Kazakhstan_To_Develop_Unique_Space_System.html>.
[441] Robert Hewson, "China Plans New Space Launchers" *Jane's Defense Weekly*, 22 November 2006.

Space Plane"[442] intended to serve as a rescue vehicle for ISS crew were eventually cut,[443] the European Space Agency is developing the Intermediate eXperimental Vehicle (IXV) as a proposed reentry system.[444] Because these vehicles are designed to primarily remain in orbit until needed for a return flight to Earth, Chapter III will explain how and why they should be considered in "orbital status" for all legal considerations.

Although the increase in business ventures might give the appearance that suborbital and orbital advancements have become a naissance of private industry, governments do and will maintain an omnipresent status in such developments. A primary reason for State interest in these programs includes the likely military applications for suborbital and orbital craft. The previously-mentioned U.S. Air Force Falcon program is a $100-million venture intended not just for insertion of LEO microsatellites, but full-scale military operations utilizing low Earth orbit, and designed to launch and return from conventional runways.[445] In a push for greater speed and insertion capabilities, the U.S. Marine Corps is particularly interested in the maturation of technologies to create Small Unit Space Transport and Insertion ("Sustain") vehicles.[446] Craft using a combination of rockets and hypersonic air-breathing boost engines, such as the Falcon, Boeing's X-51, and the Lockheed Martin Rattlrs (Revolutionary Approach to Time-Critical Long-Range Strike) typically use a first-stage launcher, which carries the

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[442] NASA, "Beginning a New Era of Space Flight: The Orbital Space Plane" *NASA Marshall Space Flight Center Fact Sheets*, online: NASA <http://www.nsas.gov/centers/marshall/news/background/facts/ospfacts.html>.
[443] Brian Berger, "NASA Takes Small Steps While Awaiting Space Plan Approval" *Space.com* (25 May 2004), online: Space.com <http://www.space.com/spacenews/archive04/nsasarch_052504.html>.
[444] Giorgia Tumino & Yves Gerard, "EXV: the Intermediate eXperimental Vehicle" *ESA Bulletin* 128 (November 2006), online: ESA <http://www.esa.int/esapub/bulletin/bulletin128/bul128h_tumino.pdf>.
[445] David Axe, "Semper Fly" *Popular Science*, January 2007, at 61.
[446] *Id.* at 58.

actual spaceship into the upper atmosphere before it boosts into low Earth orbit.[447] Such craft traveling at altitudes above 50 miles would be able to arc over hostile territory or States not granting overflight rights, and then utilize composite shields to absorb and deflect reentry heat as the vehicle enters its landing zone in the area of operations.[448]

Inspired by observing the launch of *SpaceShipOne*, Air Force General S. Pete Worden commented that a "scaled-up version of that would do this [Sustain] mission."[449] Such a lander based on the concept of *SpaceShipOne* would be bigger, tougher, armed, and reconfigured for longer flights, and would need to be robust, responsive and reusable, with the critical ability to access space with aircraft-like operations.[450] With technology related to heat shields and propulsion systems already well-advanced, and using new alloys, composites and ceramics to allow engines to withstand the extreme heat of hypersonic flight, these craft should also be "able to operate in the low speed regime much the same way that current aircraft operate."[451] Once again, the gap between air and space flight continues to be narrowed by such advancements.

Utilizing a craft to cruise above 50-mile altitudes and exploit the loophole of flying above a nation's sovereign airspace is also likely to produce diplomatic challenges.[452] Such potential political problems and the Bush administration's plan-of-attack to meet them were reflected in the new U.S. Space Policy, which expressed its clear intent to exploit space for military purposes.[453] Given the challenges that the U.S. military faced when trying to obtain overflight permission from Pakistan in the early days

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[447] *Id.* at 61.
[448] *Id.* at 59.
[449] Id. at 61.
[450] Id. at 61, 89.
[451] *Id.* at 89.
[452] *Id.* at 90.
[453] *Id.*

of Operation Enduring Freedom and the hunt for terrorist leader Osama bin Laden,[454] the Sustain program and U.S. Space Policy reflects an intention not to let bureaucratic delays negatively impact future military insertions and war-fighting efforts.[455] This effort to develop the Sustain mission and avoid the complications that can delay or end key missions is being championed by retired Marine lieutenant colonel Roosevelt Lafontant and the military technology consulting firm Schafer Corporation.[456] As colonel Lafontant concisely summarized the projected State deployment of such capabilities, "[W]hat if we don't have to have anybody's permission? What if we just go above and drop in?"[457] Orbit Law will therefore require a close examination of these matters of State sovereignty, and the impact of State versus private suborbital and orbital flights.

B. Need for Uniformity of Safety Standards.

Although Chapter III will more closely analyze the requirements to establish an Orbit Law regime, the rapid technological progress being made in suborbital and orbital flights mandates the consideration of a comprehensive safety regime as well. From a pure space-based perspective, one prime example of necessary safety governance includes the Commercial Space Launch Act of 1984, which stood as the cornerstone of U.S. regulation of space transportation for years, and was later amended in 1988, supplemented by the Commercial Space Act of 1998,[458] and ultimately revised by the

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[454] *Id.* at 59.
[455] *Id.* at 90.
[456] *Id.* at 58.
[457] *Id.* at 59.
[458] William A. Gaubatz, *International Certification for Commercial Reusable Space Transportation, in* 42ND COLLOQ. L. OUTER SPACE 247 at 250 (1999).

Commercial Space Launch Amendments Act of 2004.[459] With the primary goal of evaluating an operator's ability to ensure public safety and safeguard property and the environment, these Acts scripted the government oversight of site location safety, operating procedures accuracy, personnel qualifications, equipment adequacy, systems safety and mission reviews.[460]

The importance of such regulation was highlighted by Gaubatz as he observed "[F]or the Spaceways to expand into and service the international community, vehicle spaceworthiness and certification, as related to product liability and indemnification also must be dealt with."[461] Calling RLVs "reusable space transportation (RST) systems," Gaubatz Stated that the same fail-safe rule which governs aircraft systems must also be applied to RST systems:

> These RST systems will be expected to function within the boundaries of an international regulatory framework such has been established for the aviation industry by the International Civil Aviation Organization, ICAO. Like aviation the single purpose goal of the RST standards will be to ensure public safety and safeguard property and environment. The type of systems and service needed for commercial operations of the Spaceways can only be achieved by meeting this goal. To achieve this goal it is essential to recognize the distinction between system safety and reliability. Safety deals with the consequence of failure and reliability deals with the likelihood or frequency of failure. Safety deals with lives and property; reliability deals with cost and replacement times.[462]

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[459] Pub. L. No. 108-492, 118 Stat. 3974.
[460] Gaubatz, *supra* note 458, at 250.
[461] *Id.*
[462] *Id.* at 250-51.

Other authors share this same concern with ensuring space development remains a safe endeavor. Eilene Galloway remains optimistic about the success of international oversight for all actions in space:

> The positive elements in this situation are (1) realization by all participants that identifiable scientific and technical conditions must be maintained in order to conduct successful space operations; (2) the motive of maintaining dependable conditions for an industry that is producing billions of dollars and employing hundreds of thousands of employees throughout the world; (3) the existence of the United Nations Committee on the Peaceful Uses of Outer Space as a forum for negotiations with a proven process and record of finalizing international agreements; (4) the value of historic experience in controlling space activities by functions: registration of space objects, selection of orbits for specific launchings, notification to States potentially affected by orbiting and deorbiting satellites; and (5) possible lessons from the International Civil Aviation Organization in establishing standards of reliability and safety for planes.[463]

While this thesis is not the appropriate forum to detail the technical aspects of a safety regime, the recommendations to model such a system after the ICAO SARPs do appear to have merit.

As referenced in the discussion on Public International Air Law in Chapter I, movement towards a safety management system rather than a checklist of thousands of safety items is a logical approach to encourage State endorsement of these standards.[464]

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[463] Galloway, *supra* note 22, at 190.
[464] Bliss, *supra* note 202.

As technologies improve and more States become space-faring nations, each could balance conflicting interests and develop space annexes much like the system currently followed by ICAO, which could then be adopted by COPUOS as international space standards.[465] Nandasiri Jasentuliyana also recommended that "[I]nternational standards for the operation of spacecraft could regulate technical matters such as flight preparation, duties of the space flight commander and other officers, spacecraft instruments, documentation, communication equipment and procedures, maintenance of spacecraft, manuals and records, and other matters of a technical nature, similar (but not necessarily in the same detail, at this stage) to the corresponding Annex of the Chicago Convention....[I]nternational standards and practices could also be developed for other space activities such as: (i) safety of space operations; (ii) aerospace planes; (iii) materials processing in outer space; (iv) regulation of dangerous payloads; (v) manned space flight; (vi) space stations; (vii) satellite operations; (viii) launching and landing procedures; (ix) space navigation; and (x) communications (especially communications among vehicles in outer space)."[466]

These recommendations for the international community to learn from the success of the Chicago Convention and apply this system to the technically complex field of space technology seem to be wise counsel:

> New uses are being found for space technology, and the fields of space exploration and utilization which depend on this technological development is rapidly changing. International Space Law has developed alongside space technology, but in recent years the development of Space Law has fallen behind

[465] Nandasiri Jasentuliyana, *Celebrating Fifty Years of the Chicago Convention Twenty-Five Years After the Moon Landing: Lessons for Space Law*, 19-2 ANN. AIR & SP. L 429 at 434 (1994).
[466] *Id.* at 436.

> the pace of technological development. One reason for this outcome could be that political approaches and discussions in the international Space Law-making body, COPUOS, which worked best in the past when the primary issues it faced were related to policy or jurisprudence, are not appropriate and do not give good results when dealing with the primary technical issues which the international community now has to deal with. A solution would be for COPUOS, like ICAO, to separate the political and technical aspects of space technology and formulate international standards and recommended practices for the regulation of space activities. The time has come to consider this option, and to lay out a basic institutional framework so that the future use of space science and technology is not hindered by protracted political discussions.[467]

Although this article was written in the early 1990's, these proposals are even more relevant today, and hold the added benefit of thirteen years of additional ICAO experience, legislative improvements, perfections in technology, and international cooperation in air and space flight safety. Should the proposals of Orbit Law ever come to pass, the time should also come for international standardization of safety criteria for these orbital and suborbital flights. The Chicago Convention's ICAO system looks to be the best framework upon which to model this new regiment of protections.

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[467] *Id.* at 436-37.

CHAPTER III.

THE NEW ORBIT LAW REGIME

Although international Air and Space Law has historically been one of the few legal arenas where its drafting and development usually preceded its need for application,[468] it is apparent that advancements in technology may now be outpacing (and thereby creating) the need for new legal principles. Flight capabilities now exceed the traditional boundaries of both location and function (i.e. spatialist and functionalist approaches to air-space demarcation). Yet there remains a common factor which restricts a legal determination of the boundaries of flight under both the functional and spatial approach. That restrictive factor is encompassed in the attempt to determine either a certain functional event or break point at which a craft "breaks free" from the airspace realm and enters into outer space, rather than recognizing the ability to traverse both domains and embracing the capacity to function within both spheres of flight. New legal determinations of flight status based on a craft's orbital operation bridge the gap between airspace and outer space, location versus function, and application of the appropriate legal regime.

A. Explanations of Orbital Law and the "Blended Approach."

Although technology has merged air flight with space flight, current laws do not comport with such dual ambit capabilities, thus requiring a new approach to overcome

[468] "The Outer Space Treaty was prospective in nature, establishing laws for future actions. Most international law and treaties are reactive in nature, responding to the practice of nations." Ram S. Jakhu, *Space Law: General Principles Lecture Notes*, (Faculty of Law, McGill University, 10 October 2006).

the limitations of the Air Law/Space Law "either-or" determination based *solely* on flight status or location. The common flaw that both regimes share includes trying to make a mission-based (functional) or linear (spatial) determination of that boundary, both of which seem tied to *atmospheric* restraints. While spatialists are looking for a dividing-line within the atmosphere, functionalists limit flight activities as either purely aeronautical or space-based, without being able to categorize these new craft which cross and function within both atmospheres.[469]

The more logical approach to distinguish between different types of flight would focus on time and gravitational (i.e. orbital) boundaries. This new approach would determine whether and for how long the craft were able to remain *in orbit* above the Earth's gravitational force, instead of simply "aloft" in or above any certain point in its atmosphere, or simply performing a particular air or space flight duty. Hypothetically, if one were to remove the limitations of gravity from the equation and no longer make it a restraint on the craft's flight (much like the possibility that a purely "orbital craft" might present in the future, or the ability to overcome atmospheric restraints that modern "space planes" currently demonstrate), and instead examine "orbital status" of the craft, this proposal might enable a new legal regime that overcomes the limitations of both the functional and spatial approaches.

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[469] The term "atmosphere" is used in the broadest sense here. Although "space" is not typically thought of as having any atmosphere, the Earth's atmosphere does extend far enough above the planet into regions that are generally agreed to constitute outer space. While the troposphere extends from the Earth's surface up to a height varying from 6-20 km, the stratosphere begins at the top of the troposphere and extends upwards to approximately 50 km. Above that region lies the mesosphere up to approximately 85 km, after which extends the thermosphere to approximately 600 km. The outer most region of the Earth's atmosphere includes the exosphere, which extends to an altitude of approximately 10,000 km. *See generally* NASA, "Earth's Atmosphere" *Exploration*, online: NASA <http://liftoff.msfc.nasa.gov/academy/space/atmosphere.html>.

Identifying a craft's orbit will actually reflect a blending of both the functional approach (by examining whether or not the craft is engaged in or planned for an orbital rendezvous with the Earth or some other celestial body) and the spatial approach (by examining the craft's location and distance covered to determine whether it meets orbital requirements). This new method of examining a craft's orbital status (which includes an analysis of the aspects of time, space, and function) might finally overcome the arbitrary and limiting factors of examining *only* location *or* function to determine its legal status.

For example, the spatial measurement of altitude *alone* would not be a factor in determining whether a craft was in an orbital status or not. If advances in technology enabled a craft to maintain an altitude of approximately 30 miles (well below the spatialists' traditional line of demarcation between airspace and outer space), yet complete one orbit around the Earth, it should qualify for orbital status. But if this same craft touched down at some point before completion of one revolution around the Earth, it would remain in a suborbital status.

A "time aloft" standard would also dictate whether a craft were in orbital or suborbital status. Again removing gravity from the equation, a craft which was able to remain above the Earth for a certain period of time might qualify for orbital status. The ability of a craft to "hover" above the Earth and qualify as an orbital flight would be logically based on comparison to satellites which appear to "hover" in the Geostationary Orbit.

By re-categorizing flights and determining a craft's legal status based on their orbital standing, rather than solely as an "aircraft" or "spacecraft," a new legal regime can be established that blends the best aspects of both Air Law and Space Law. Even in the

absence of such technology enabling craft to simply overcome gravity, the current trans-atmospheric capabilities of "space planes," and the benefit of replacing the "airspace versus outer space" dichotomy with an orbital regime, is advantageous for confronting the complex legal scenarios that modern technologies have created and continue to evolve.

1. The Science of Orbit and the Art of Orbit Law.

In order to fully explore the prospects of Orbit Law, a brief explanation of the science of orbital motion is appropriate. The laws of physics, gravity and orbital motion and the concepts associated with planetary motions were initially explained by Johannes Kepler (1561-1630), who described the positions and motions of objects in our solar system.[470] Isaac Newton (1643-1727) later reasoned that Kepler's laws worked based on their dependence on gravitation – the mutual attraction of all masses in the universe.[471] In our solar system, planetary motions are elliptical orbits gravitationally bound to the sun, but all orbital motion is based on these same Newtonian principles.[472] Any object will orbit a more massive body (such as a planet) when the centrifugal force generated by its velocity balances the forces of gravity between the two, but the force of gravity exerted by one object on another decreases with the square of distance between them.[473] To move in a curved path, a planet must accelerate toward the center of its circular path –

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[470] *See generally* Johannes Kepler, NEW ASTRONOMY (1609); Johannes Kepler, THE HARMONY OF WORLDS (1619).

[471] *See generally* Dave Doody, "Basics of Space Flight" *Jet Propulsion Laboratory, California Institute of Technology* (February 2001), online: NASA <http://www.jpl.nasa.gov/basics/>.

[472] *Id.*

[473] *See* Isaac Newton, MATHEMATICAL PRINCIPLES OF NATURAL PHILOSOPHY (1686).

a motion known as centripetal acceleration, which in our solar system is supplied by the mutual gravitational attraction between the sun and the planet.[474] Unless the foci are coincident, orbital paths will be in the shape of an ellipse.[475]

In order for an object to achieve orbit with the Earth, it must have sufficient boost to escape the initial pull of gravity and accelerate to the point that once it begins to fall back towards the surface, it essentially falls completely around the planet.[476] The minimum necessary speed to escape the Earth's gravitational field and reach orbit is 7.9 km/sec, which is also known as First Cosmic Speed.[477] If the craft does not have enough thrust and/or speed (also approximately calculated at 30,000 km/hr) to attain sufficient altitude and overcome gravity, the effects of gravity and atmospheric drag will cause the object to follow its ballistic arc and return to Earth.[478] For purposes of the new Orbit Law regime, such flights are considered *suborbital flights*.

But for those objects obtaining the necessary orbital launch propulsion, that object can remain in orbit for months, years, or even longer (depending on its altitude) before its orbital status begins to degrade.[479] The point at which an object in orbit comes closest to the mass around which it rotates is called the periapsis of the orbit, while the highest point in the orbit is called the apoapsis.[480] Altitude also affects the time it takes the object to complete its orbit, which is known as the orbit period.[481] Because of the marked reduction in gravitational effects with distance, an object in low Earth orbit needs

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[474] *See* Doody, "Basics of Space Flight," *supra* note 471.
[475] *Id.*
[476] *Id.*
[477] Thomas Beer, *The Specific Risks Associated with Collisions in Outer Space and the Return to Earth of Space Objects – the Legal Perspective*, 25 AIR & SPACE L. 42 at 44 (2000).
[478] *See* Doody, "Basics of Space Flight," *supra* note 471.
[479] *Id.*
[480] *Id.*
[481] *Id.*

significantly more speed to maintain its orbit than an object in higher orbit.[482] But until such technology is created enabling a craft to completely overcome the bonds of gravity regardless of thrust and velocity, these principles of physics currently apply not only to satellites, but to any craft engaged in *orbital flight* with the Earth. For example, while the International Space Station located nearly 250 miles above the Earth's surface makes one complete Earth orbit approximately every 90 minutes, a satellite positioned 22,300 miles above the Earth's equator in what is known as the Geostationary Orbit will take one day to complete a single circuit.[483] Each of these satellite's voyages would be considered an *orbital flight* under the Orbit Law system.

As previously mentioned, Orbit Law would include a "time aloft" standard to also qualify for orbital flight based on the comparison with satellites which appear to hang motionless above a particular point on Earth. Craft positioned at an altitude of 22,300 miles (approximately 36,000 km) will take precisely one day to complete a single circuit above the Earth in what is known as the geosynchronous orbit (GEO).[484] This GEO is a prograde, circular orbit having a period of 23 hours, 56 minutes, 4 seconds.[485] If the craft is placed in this orbit directly above the Earth's equator with an inclination of zero degrees, its flight will not only be synchronized with the Earth's rotation, but also appear from the surface to be stationary and is commonly known as the "Geostationary Orbit" (GSO).[486] Based on this orbital epoch taking 23 hours, 56 minutes, 4 seconds to qualify as one geosynchronous or Geostationary orbit, the new Orbit Law standard will also

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[482] Lawrence D. Roberts, *A Lost Connection: Geostationary Satellite Networks and the International Telecommunication Union.* 15 BERKELEY TECH. L.J. 1095 at 1099 (2000).
[483] *Id.*
[484] *Id.*
[485] *See* Doody, "Basics of Space Flight," *supra* note 471.
[486] Roberts, *supra* note 482.

include the same measurement of time as one qualifier for a craft to be considered in Earth orbit.

However, as inter-planetary (or even inter-stellar) travel becomes feasible, one must also consider the potential application of Orbit Law beyond the Earth's orbit. Therefore, another orbital consideration includes the launch of an object from one (planetary) orbit to another. This process is currently accomplished using Hohmann Transfer Orbits, while the portion of that orbit which takes the object to its next location is known as its trajectory.[487] Such orbital transfers would qualify as an *inter-orbital* flight in the new Orbit Law scheme. For example, if a craft were to travel from Earth to Mars, where it then remained in orbital status above that planet, the craft would be considered to accomplish *inter-orbital flight* during its transit between Earth and Mars, and then enter into *orbital flight* once it took its orbital position around the "Red Planet." Although these Orbit Law proposals will apply the same legal standards to orbital and inter-orbital flights, it is nonetheless important to distinguish between these two cosmic realms.

As each planet's rotational period varies, the "time aloft" standard to qualify for orbital status will vary from planet to planet. Mars' rotation period takes 1.027 Earth days to complete one rotation, while Mercury takes 175.942 Earth days to complete its rotation; Venus' retrograde rotation results in a -243 Earth days comparison for its completion of one rotational cycle.[488] Jovian planets typically have much faster rotation periods; Jupiter takes only 9.9 hours to complete one rotation, Saturn requires 10.7 hours,

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[487] *See* Doody, "Basics of Space Flight," *supra* note 471.
[488] *Id.*

Uranus takes 17.2 hours, and Neptune needs 16.1 hours for its revolution.[489] Therefore, in order for a craft to be considered "in orbit" based on a synchronous "time aloft" above that planet, the standard will vary from planet to planet.

2. The Need for a "Blended Approach".

Many authors have foreseen the problems posed by craft that are able to function in both air and space environments. Dr. Eilene Galloway provided an excellent overview of the problem in 1998 when she observed:

> Defining the difference between sovereign airspace and nonsovereign outer space has been a continuing concern for lawyers seeking definite basis for legal situations involving airplanes and satellites. COPUOS sought, but found it impossible to obtain, a scientific basis for demarcation. Meanwhile, space activities flourished on the basis that airspace extends to the height that planes can fly while outer space begins where satellites can go into orbit. Proposals for an artificial line have not found acceptance, probably because there have been no problems since the space age began that required for their solution a line between airspace and outer space....The probability of spaceplanes that can fly in both airspace and outer space will add a new dimension to this problem, and it will be necessary to find out what functions such an object performs and how it is to be regulated....We shall need a new definition of the entire problem: the relation of

[489] *Id.*

this new technology to sovereignty; the effects on the International Civil Aviation Organization, and how spaceplanes fit into regulation for international security.[490]

G. P. Zhoukov's observations also provided support to the notion of a blended approach for objects based on their orbital status. Zhoukov noted that functionalists categorize space objects by referring to its propulsion systems, as opposed to aircraft which rely on the properties of air for their flight.[491] However, such a functionalist approach did "not sufficiently take into consideration the potential developments of space travel – particularly the advent of reusable space ships fitted with air reactors that use the aerodynamic properties of air for their return to Earth."[492] Spatialists preferred the location in which the object was to operate, and suggested that a space object's defining characteristic be the fact that it was intended for flight operation in outer space.[493] But this approach did not account for "space objects" not yet launched into space, and would therefore not appear to meet the definition of a space object despite its locational qualifier.[494] Although space objects are technical devices, they do not qualify for treatment under international Space Law unless the object has been launched to or constructed in space – when the object enters artificial Earth satellite orbit or travels farther away, or is constructed in space or on some other celestial body, the international legal provisions of Space Law remain applicable until its landing or destruction upon re-entry into the atmosphere.[495]

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[490] Eilene M. Galloway, *Guidelines for the Review and Formulation of Outer Space Treaties, in* 41ST COLLOQ. L. OUTER SPACE 245 at 251-52 (1998).
[491] G. P. Zhukhov, *supra* note 317, at 361.
[492] *Id.*
[493] *Id.*
[494] *Id.* at 362.
[495] *Id.*

Under either the functional or spatial approach, there comes a time during any craft's flight that it will likely transit national, and/or perhaps international, airspace. One country's methodology for combined use of airspace by aircraft and spacecraft compared the need for new regulations against the possibility that existing legal guidelines were sufficient for such transit.[496] In this study, it was discussed how Germany has structured its airspace under the supervision of the DFS (Deutsche Flugsicherungs GmbH), and that the operator of a *spacecraft* who wished to use national airspace would have to accept air traffic management instructions just like an airline.[497] The United States Federal Aviation Administration (FAA) also planned for a combined use of airspace by air and spacecraft using the "Space and Air Traffic Management System (SATMS Project)."[498] But while these States appeared to be getting a grasp on a functional combined management system, the more difficult challenge posed by dual-use flights focused on management of *international* airspace being used by spacecraft.

The main international legal instrument for all civil aviation is the Chicago Convention; given the fact that 185 States have ratified this treaty, it can be regarded not only as multilateral but as universal.[499] However, its application to spacecraft and the corresponding traffic is still subject to question. Because the Convention and it Annexes have all been released without any inclusion or reference to spacecraft, Köster believed that application of this treaty by analogy would be against the declared text and intention of this legal work.[500] As such, the Convention should not be considered applicable to

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[496] Marina Köster, "Legal Problems Related to a Combined Use of Airspace by Air and Spacecraft," Report at the *Project 2001 Workshop on Commercial Launch Services* 137, Bremen, Germany (Jan. 19, 2000).
[497] *Id.* at 140.
[498] *Id.* at 141.
[499] *Id.*
[500] *Id.* at 142.

spacecraft, and transit of a spacecraft through international airspace, as well as launches and re-entries from international territory, is free.[501] Because civil aviation and spaceflight are two equal users of international airspace, and with the increasing number of space-related launches and re-entries, consideration should be given to a new international agreement to manage such traffic and ensure its safety.[502]

Stephen Gorove in his article *Aerospace Object – Legal and Policy Issues for Air and Space Law*, also predicted the potential need for new pioneering legislation:

> [I]f future technological developments were to create a hybrid vehicle capable of moving freely in the air like an aircraft and also moving at will in outer space, a consideration of new laws, both domestic and international, may become necessary in order to adjust legal regulations to the latest scientific and technological innovations.[503]

The influence of this author's work on the Orbit Law innovations will be discussed in greater detail in the paragraphs which follow. Suffice it to say, each of these author's predictions have come to pass with the numerous advents in technology, thereby spurring the need for new legal considerations for blended air and space flights.

B. Examination of Sub-Orbital Flights & Progression of Orbit Law.

The first fundamental premise of the new Orbit Law legal system includes the application of all current public and private international Air Law tenants to all suborbital flights. In other words, the existing international Air Law regime will apply to suborbital

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[501] Id.
[502] *Id.*
[503] Gorove, *supra* note 82, at 112.

flight. While the evolution of Orbit Law and this thesis will propose eventual modifications to the law of suborbital flight, initial legal applications for suborbital flight will be based on existing legal principles found in Air Law.

It should be noted that Stephen Gorove's article on *Aerospace Objects*[504] provided much of the impetus for the author's ideas behind an orbital-based legal framework. However, one major difference between Gorove's analysis and these new proposals is that Gorove seems unduly focused on the aerospace *object*, as opposed to the orbital flight emphasis of this new regime. The Gorove paper initially does a good job of differentiating simple "aerospace objects" from "space transportation systems," the latter having broader meaning and including space-shuttle-type transportation systems as well as typical rocket carriers.[505] "Aerospace objects" would therefore not be an appropriate term for hybrid systems that might be used for both air flights and outer space missions.[506]

Gorove also examined the Russian proposal for "aerospace objects" and its two distinct purposes as outlined in their response to the UNCOPUOS Legal Sub-Committee Questionnaire of 1996.[507] The Russian answer identified one possible aerospace object's purpose as flight from one point on Earth to another (a part of which might occur in space, but not attaining cosmic speed), while the other purpose included delivering crew and/or payload into outer space and later returning back to Earth (as well as being able to remain in airspace for a certain period of time).[508] Gorove Stated that an appropriate legal regime for these two distinctly different aerospace objects needed to be identified,

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[504] Gorove, *supra* note 82
[505] *Id.* at 103.
[506] *Id.*
[507] U.N. Doc. A/AC 105/635/Add.1, at 4-5 (1996).
[508] Gorove, *supra* note 82, at 104.

and he based his analysis of the aerospace objects on a comparison of their status as an *aerospace plane* versus a space-shuttle-type vehicle, i.e. a "*space object.*"[509]

Gorove foresaw early versions of the aerospace plane as designed for terrestrial transportation purposes – taking off from a point on Earth, and flying in airspace and traversing the fringes of outer space without completing an orbit, all for the sole purpose of reaching another point on Earth.[510] He also identified the main problems with such a versatile vehicle – delimitation and definition of airspace and outer space, the status of astronauts, and issues of liability, registration and jurisdiction.[511] While some new international agreement or other accommodation might be necessary to resolve disputes between traditional (national) airspace and outer space, Gorove suggested that if the aerospace plane only operates as an Earth-bound transportation system and incidentally reaches the fringes of outer space, then Air Law should be applicable to it.[512]

This proposal mirrors that of the Orbit Law regime for a craft meeting the criteria of "suborbital" status, yet with different qualifiers. While Gorove focused on the aerospace *object* itself and *functional* qualifiers, Orbit Law instead looks at the orbital status achieved, coupled with the intent of the mission. As explained in the section on Orbital Qualifiers in paragraph C. below, a craft intended for orbital flight would maintain that status for the duration of its mission (whether or not it actually achieved orbit). But a suborbital craft which accomplishes one orbit based on the qualifiers explained in this thesis would <u>also</u> qualify for orbital status. In other words, suborbital flights might also qualify for orbital status, but the reverse scenario of orbital flights

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[509] *Id.* at 105-106.
[510] *Id.* at 105.
[511] *Id.*
[512] *Id.* at 106.

reverting back to suborbital status would not be true under the current Orbit Law proposals. Such a status was not discussed as an option by Gorove. Justification for this one-sided consistency will follow in forthcoming sections.

Gorove also proposed that aerospace planes (i.e. "suborbital" craft under Orbit Law) might be expected to comply with space debris mitigation, rules of the road, and other requirements while operating on the fringes of space.[513] He also questioned whether Space Law would govern an object orbiting the Earth at a height of 30 km if new technology enabled it to maintain that orbital height, but speculated that new technology would not likely lead to an acceptance of lowering the height of "outer space" to 30 km.[514] As explained below in the section detailing orbital flight status, Orbit Law would not "lower" outer space to a different altitude, it would simply apply existing Space Law (and eventually new Orbit Law concepts) to all orbital flights, with Air Law being applicable to suborbital trips.

Therefore, the remainder of this section will analyze the importance of liability and insurance considerations for suborbital flights. Status of the craft itself and State versus private responsibility for flights will be the focus of Section C on Orbital Flights. But for suborbital considerations, these hybrid vehicles will essentially be treated as space-capable objects subject to Air Law. The Considerations of public international Air Law and corresponding issues of State sovereignty for suborbital flights will be reserved for discussion in Section E of this chapter under the "Open Skies" proposal. However, a proposal suggesting that the Rescue and Return Agreement be applied to suborbital flights will be fleshed out later in this section.

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[513] *Id.*
[514] *Id.*

1. Liability & Insurance Considerations.

The obligation of States to otherwise prevent harm, and provide restitution in the event of its actual occurrence, is firmly rooted in international law. *Corfu Channel* held that "[F]ormerly, the misuse of a right had no place in law. Anyone could exercise his rights to their fullest extent, even if the effect was prejudicial to others; in such cases there was no duty to make reparation. That is no longer the case....[T]here are two questions to be determined: (a) when is there a misuse of a right; and (b) what should be the penalty? In regard to the former point, the facts must be evaluated in any given case; and in regard to the penalty, this may consist, according to circumstances, of an apology, a rebuke or even compensation for the injury caused."[515] Thankfully these requirements and methods for reimbursement of wrongs were embraced by the Montreal Convention of 1999. With the initial application of private international Air Law to suborbital flights during the early years of an Orbit Law administration, hopefully the suborbital system will develop a stable regime of liability similar to that of Air Law.

Although the Warsaw-Montreal systems are recognized to be a fault-based regime,[516] it should not be confused with the system of *absolute* liability for space flights under the Liability Convention.[517] A number of scholars have observed that although current Air Law liability is akin to *res ipsa loquitur*, it is still a fault system rather than one of automatic application of liability[518] as contained in Article II of the Liability

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[515] *Corfu Channel Case*, (Alb. v. U.K.) 1949 I.C.J. 4 at 47-48 (1949).
[516] Dempsey & Milde, *supra* note 207, at 137.
[517] Liability Convention, *supra* note 144, art. II.
[518] Dempsey & Milde, *supra* note 207, at 137.

Convention. *Res ipsa loquitur* requires that (1) the accident is of a kind that does not ordinarily occur in the absence of someone's negligence; (2) it was caused by an agency or instrumentality within the exclusive control of the defendant; and (3) it must not have been due to any voluntary action or contribution on the part of the plaintiff.[519] The Conventions therefore create only a rebuttable presumption of carrier liability, but ultimate liability is still dependent upon proof of fault.[520] And although the plaintiff does not have to prove negligence or misfeasance on the part of the carrier, they still carry the burden of proving that an "accident" has occurred.[521]

The resulting assignment of liability for those events constituting Article 17 "accidents," and system of apportionment of damages up to and above 100,000 SDRs under Article 21, is a logical starting point for suborbital flights too.[522] Given the likely similarities, and low survivability, of "accidents" or crashes involving aircraft or suborbital craft, the victim-oriented compensation scheme of Montreal Convention should provide levels of stability and known insurable amounts to successfully finance suborbital development without overburdening insurable risks. For comparison, one insurance expert recently observed that it was not the compensation methods of the Montreal Convention which increased insurance costs for aviation, because similar recovery schemes were already known and in place before the 1999 Convention was eventually ratified.[523] Rather, it was the unknown and unforeseeable risks of the terrorist hijackings of 9/11 which drove up insurance costs.[524] Another danger to the aviation

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[519] *Id.*
[520] *Id.*
[521] *Id.* at 141.
[522] Montreal Convention, *supra* note 214, arts. 17, 21.
[523] Ulla Norrhäll, *Private International Air Law, Guest Lecture Notes*, (Faculty of Law, McGill University, 26 October 2006).
[524] *Id.*

insurance industry includes the risks of litigation in U.S. courts, which typically award greater damages than courts in other countries.[525] However, the reverse of this tenant is often true as well – other countries regularly place a much lower value on losses, including loss of life.[526] Standardization of compensation for suborbital flight accidents like that which occurs in the Montreal Convention reflects a more equitable reimbursement plan, as well as one which insurance actuaries should be able to accurately measure to determine appropriate (and affordable) insurance rates.[527] Orbit Law would also include a clause for periodic review for these limits of liability like that imposed by Article 24 of the Montreal Convention.[528]

Analysis of orbital flights and the corresponding influx of Space Law principles (mainly State responsibility)[529] is at a loggerhead with the existing Air Law structure of private party liability. This dichotomy will be dissected in Section C on Orbital Principles. But for *suborbital* flights (and eventually orbital flights too), the emphasis in Orbit Law remains on holding the *carrier* liable for any negative outcome, subject to the previously-explained rebuttable presumption of fault. Section C will elaborate the extent of responsibility based on the corporate structure of each carrier (along with any/all subsidiaries) and their involvement in the suborbital or orbital endeavor, but a preliminary explanation of this proposal will help prepare the playing field.

For example, sole-State airlines (e.g. Aeroflot) would bear primary responsibility for its flights, just as private carriers (e.g. United Airlines, U.S. Airways, etc.) would bear any burden of liability for its flights. Orbit Law proposes to establish an international

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[525] *Id.*
[526] *Id.*
[527] *See generally* Dempsey & Milde, *supra* note 207, at 183.
[528] Montreal Convention, *supra* note 214, art. 24.
[529] Outer Space Treaty, *supra* note 9, art. VI.

structure for recovery regardless of national laws, sovereign status, or location of incorporation – each carrier would be ultimately responsible for any damages it causes from suborbital (or orbital) accidents. For those carriers with multiple "personalities" (e.g. sole State carriers, multi-national entities, inter-governmental enterprises, private corporations, etc.), the extent of each party's supervision and exercise of control over operations should likewise dictate responsibility over all legal matters, fiscal accountability, and corporate "ownership" of all suborbital events.[530] In other words, Orbit Law recovery for suborbital wrongs will initially mirror that system in place for private Air Law. Allocation of damages among the various entities within a multi-partner corporate structure can be negotiated during the evolution of Orbit Law, but should be based on general principles of tort law apportioning blame based on the extent of involvement.[531] States and/or private suborbital "airlines" which refuse to honor payment of damages which have been properly and formally calculated and adjudicated may be subject to ICAO sanctions, I.C.J. action, and possibly unilateral action by a host of other States electing to prevent its suborbital spaceplanes or other craft from traversing its airspace.[532]

As Section E in this chapter on "Sunset Clauses" will eventually discuss, it is also proposed that a more streamlined system of liability and recovery will eventually emerge, and suborbital flights' reliance on the current private international Air Law system will

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[530] *See generally* Cheng, *Article VI, supra* note 268, at 20-29 ("[W]hile the function of control may be delegated to another State, the State's responsibility and liability under Articles VI and VII of the Space Treaty or the 1972 Liability Convention cannot. Consequently, even where a State has absolute confidence in the State designated to discharge this task, and however watertight the hold-harmless clauses in the agreement may appear to be, in practice, it may not be entirely wise for it no longer to concern itself with the matter....All in all 'the appropriate State' appears thus to be a rather elusive notion. In practice there may well be more than one 'appropriate State,' *de facto* or even *de jure*.").
[531] *See generally* Maniatis, *supra* note 265, at 387-88.
[532] Dempsey, *supra* note 158, at 373 *et seq.*

eventually melt away. Although the Montreal Convention serves as an excellent starting point for suborbital liability determinations, as Chapter I.B. highlighted, it is not a perfect product. Precise definitions of "accident," the possibility (or impossibility) of punitive damages for deliberate misfeasance, and potential recovery for mental or other injuries are some of the many issues debated by Air Law which must be addressed and revisited during Orbit Law's growth and development. As part of this streamlining process, the next section discussing Orbital Flight Liability considerations will also propose a "morphing" of suborbital liability components into orbital flights as well. The two separate systems of liability for Air Law/Space Law, or suborbital/orbital law, will eventually meld into one overarching method of accountability.

2. Application of the Rescue & Return Agreement.

Without digressing into the delimitation debate of whether suborbital flights are truly space flights, thereby qualifying its personnel as "astronauts" under the Outer Space Treaty,[533] Orbit Law will propose to impose the requirements of the Rescue and Return Agreement for all suborbital flights. As highlighted in Chapter I. C., international cooperation and the duty to provide aid to aircraft and crew who land on foreign soil through accident, mistake or distress is a longstanding requirement which has been carried over to spacecraft as well.[534] The extension of these protections to suborbital flights is hardly a stretch of existing international law. International search and rescue standards for *all* flights, be they air, space, suborbital, or orbital, could be based on the

[533] Outer Space Treaty, *supra* note 9, art. V.
[534] McDougal, Lasswell & Vlassic, *supra* note 21, at 523.

example of Annex 12 of the Chicago Convention and the Rescue and Return Agreement.[535] Establishment of search and rescue services and regions, equipping rescue units, facilitating assistance between States, disseminating information between all parties, standardizing preparatory measures, and instituting common operating procedures will form a solid backbone of international cooperation needed for suborbital and orbital growth and development.[536]

C. Examination of Orbital Flights & Progression of Orbit Law.

The next fundamental premise of Orbit Law includes the application of current Space Law principles and treaties to all orbital flights. Although Orbit Law's maturation will eventually generate its own *corpus juris spatialis internationalis* based on the precedence of Air Law and Space Law, its genesis must begin from these currently-existing legal foundations before such an evolution may occur.

Gorove's "Aerospace Objects" article again provided inspiration for the idea of legal determinations for flight based on orbital status, yet Gorove focused more on the (space) object and its functional intent rather than orbital qualifiers. He proposed defining a space object as "an object launched or attempted to be launched in orbit around the Earth or beyond. Such object (or a part of it) is a space object (or a part of it) from the time of its launch or attempted launch, through its ascent from Earth to outer

[535] Jasentuliyana, *supra* note 465, at 435.
[536] *Id.*

space or while in outer space, as well as during its orbit, deorbit, reentry and landing on Earth."[537]

Under the current Space Law regime, such objects represent national assets over which the *State* wields jurisdiction and control.[538] Because spacecraft may be more valuable bases of power than aircraft or ships, States might be unwilling to yield their jurisdiction over such craft, and will likely maintain a substantial proprietary interest in protecting its assets.[539] Contrast this sovereign stance of States and the sole-State responsibility of the Outer Space Treaty[540] (and other space instruments) against the increased role of private party action in space, and the stage is set for potential conflict between public and private international law. Although the existing space treaties attempt to resolve this problem by simply imposing State responsibility and liability for all space actions,[541] they are insufficient to adequately address today's technological and corporate spikes in space activity. Orbit Law will hopefully quell the "danger of chipping away at the 1967 Outer Space Treaty by protocols instead of adding more agreements"[542] by imposing new legal guidelines across orbital and suborbital flight.

However, Judge Manfred Lachs also cautioned that:

> [T]he interdependence of the traffic in the air and outer space should not subject the activities of States to unnecessary limitations. To survive in the world today

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[537] Gorove, *supra* note 82, at 107.
[538] Outer Space Treaty, *supra* note 9, art. VIII.
[539] McDougal, Lasswell & Vlassic, *supra* note 21, at 516, 524.
[540] Outer Space Treaty, *supra* note 9, art. VI.
[541] *Id.* at arts. VI, VII; *et al.*
[542] Galloway, *supra* note 22, at 191.

States need to open the frontiers of the air to other States unless they prefer to live in complete isolation, where very few, if any, could survive and develop.[543]

With this frame of reference, this section will explore the strictures to qualify for orbital status, and ponder whether the existing parameters of liability for Space Law are appropriate for application to Orbit Law. An analysis of whether the notion of State sovereignty over airspace is an outdated principle will be reserved for Section E under the potentially controversial "Open Skies" proposal.

1. Orbital Functions & Qualifiers.

The 1975 Registration Convention calls for the registration of space objects only upon their placement in *orbit* around the Earth or farther away.[544] However, a question of great significance is whether objects *designed and destined* for orbital flight, but return to Earth before one complete revolution (i.e. a fractional orbital flight), should be considered as a space object.[545] Under the Orbit Law guidelines, an object *intended for or accomplishing orbital status* would qualify as an orbital flight.

Some jurists maintain that the international space agreements would only apply to devices which complete one revolution around the Earth, whereas fractional orbital flights such as those used in intercontinental ballistic missiles (ICBM's) would not qualify.[546] However, ICBM's are distinguished from traditional orbital objects based on their design and flight; whereas ICBM's follow a ballistic trajectory, space objects reach

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[543] Manfred Lachs, *Freedom of Air – the Way to Outer Space, in* AIR AND SPACE LAW: *DE LEGE FERENDA* 244 (T. L. Masson-Zwann and P.M.J. Mendes de Leon, eds., 1992).
[544] Registration Convention, *supra* note 342, art. II (emphasis added).
[545] Zhukhov, *supra* note 317, at 363.
[546] *Id.*

sufficient fractional speed to enter Earth's orbit.[547] Space objects which leave orbit to return to Earth use braking devices, and by virtue of their design and operation fall within the scope of the Registration Convention and other space treaties.[548] Such comparisons between (suborbital) fractional orbit devices and "true" (orbital) space objects fit nicely within the Orbit Law gambit.

For example, a suborbital craft which remained aloft for sufficient time to qualify for orbital status, or completed one revolution around the Earth, would qualify for orbital treatment. But the reverse would not be true. If an orbital craft intended for orbital flight returned to Earth before meeting orbital time requirements, or before completing one revolution around the Earth, it would nonetheless still be considered an orbital flight. This one-sided approach is proposed to attain and ensure some consistency for orbital flights, especially considering the issues of liability, State responsibility and sovereignty discussed elsewhere in this paper. Because the application of current Space Law principles to orbital flights under this newly-proposed program will initially subject States to greater potential risk through the "absolute liability" of the Liability Convention,[549] but eventually provide greater legal protections during the evolution of Orbit Law, applying orbital status to all orbital flights (intended and accomplished, as well as all flights *servicing* orbital objects) should ensure stability to adequately insure, support and promote this burgeoning industry.

Although qualifying for orbital flight under Orbit Law is based on the blended approach of location *and* function, this functional emphasis has precedence in former discussions about reusable space ships. Although some States have proposed that such

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[547] *Id.* at 364.
[548] *Id.*
[549] Liability Convention, *supra* note 144, art. II.

space ships be considered aircraft when re-entering the lower layers of the atmosphere, prevailing opinions (including the U.S. and former U.S.S.R.) refer to such craft as space objects during all phases of their flight.[550]

Support for the "time aloft" standard as a second qualifier for orbital status can be referenced back to the discussion on Geostationary Orbit objects, in addition to comparing its applicability to HAPS and geostationary stratospheric platforms. Martine Rothblatt's article on such platforms speculated that a literal interpretation of current Space Law treaties would likely exclude such stratospheric objects as space objects, but that certain Space Law treaties should be amended and would be better served by defining geostationary stratospheric platforms as objects in outer space.[551] It makes no sense that one satellite located at 40,000 km is deemed a space object, when another one serving with identical functions at 20 km would be considered an "aircraft" subject to Air Law.[552] For a legal regime to apply Space Law for communication platforms from 40,000 km to 100 km, but then instantly "transmogrify into a regime of Air Law once the communication platform is located in the 20-30 km range," is illogical given their identical use and purposes.[553] In fact, Rothblatt notes that application of the principles of Space Law to these low Earth orbit objects, such as demilitarization, liability, and the rescue and return of stratospheric platforms, are in the interests of all countries.[554] "Based on the advent of stratospheric platforms, it is now time to extend the range of

[550] Zhukhov, *supra* note 317, at 364 (emphasis added).
[551] Rothblatt, *supra* note 53, at 1.
[552] *Id.* at 2.
[553] *Id.* at 3.
[554] *Id.* at 4.

Space Law down to the 20 km regime above controlled airspace where the satellites of tomorrow will reside."[555]

Even at these lower altitudes where suborbital (and orbital) craft may soon transit and share airspace with HAPS, the author acknowledges that Air Law *currently* subjects aircraft to two different legal applications – international Air Law over the high seas, and domestic law over the territory of sovereign States. The same tenets of international law and adherence to notions of State sovereignty hold true for ships on the high seas, versus those in a State's territorial waters. By applying Orbit Law principles based on *orbital* status (regardless of *altitude or location,* over State territory, and irrespective of *transit* or *maintenance of orbital position*), this common qualifier may unite the differing and inconsistent standards that plague successful unification of an Air Law system across national and international borders. "Open Skies" enabling such trans-boundary flights will be discussed later in this chapter. Perhaps the acceptance of universal safety SARPs discussed in Chapter II might serve as a unifying starting point to promote one overarching code of flight – Orbit Law.

For stratospheric platforms or any other craft intended to or achieving continuous and/or geostationary flight for a period of 23 hours, 56 minutes, 4 seconds (the minimum time qualifier for one geosynchronous orbit), application of orbital status and the principles of Space Law would prevail under the Orbit Law regime. One interesting logical extension of this orbital qualifier would create "orbital status" for many flights that are currently deemed subject to Air Law. Examples include aircraft missions which refuel and continuously fly beyond the approximately 24-hour requirement. Balloons which remain aloft beyond that time would also enter into orbital status. However, given

[555] *Id.*

the circumstance that both types of flights remain for an extended period of time above the Earth's surface, albeit at lower altitudes than one might ordinarily be considered to be "in orbit," under Orbit Law it is a fact that these air refueling missions or balloon flights are maintaining an aerial presence that meet or exceed the time required for one geosynchronous orbit above the planet. It therefore does not seem too great a stretch of logic to apply orbital status, and thereby the principles of Space Law, under the new Orbit Law proposal. Whether exceptions or "opt out provisions" should be made for traditional yet extended air flights such as these is beyond the scope of this thesis' analysis.

2. Liability & Insurance Considerations.

Freedom of space and an obligation of space actors not to adversely interfere in the enjoyment of these rights[556] is founded in a "universe of law postulated that the freedom of each of its subjects should be bounded by equal respect for the freedoms of other subjects; that States engaging in an activity which might cause injurious consequences internationally should take reasonable account of the interests and wishes of other States likely to be affected."[557] As previously mentioned, the initial application of Space Law principles to orbital flight will provide the starting point for Orbit Law. And as explained in Chapter I, application of absolute liability during the launch phase, and fault-based liability during the orbital phase of space flight,[558] should initially

[556] Jakhu, *Satellite Imagery, supra* note 4, at 75.
[557] *Preliminary Report on International Liability for Injurious Consequences Arising out of Acts not Prohibited by International Law*, U.N. Doc. A/CN.4/334/Add.2, paras. 52, 56, 60 (1980).
[558] Liability Convention, *supra* note 144, arts. II, III.

provide new orbital flights with the historical foundation and existing structure to support its embryonic development.

As discussed in Chapter II, the U.S. Commercial Space Launch Act of 1984 and 1988 not only established a safety regimen for commercial space activities, but also addressed issues of liability emerging from this increased private industry activity.[559] In order to cover all situations of potential liability by the U.S., these Acts established licensing requirements, which included insurance coverage to address instances of third party liability.[560] These provisions required the licensee to obtain sufficient coverage to indemnify the government in case there was an accident where the U.S. was held liable to third States for damage caused by the space activities of U.S. licensees.[561] Coverage amounts at that time were capped at $500,000,000, with any successful claims above that amount to be paid by the U.S. up to a ceiling of $1.5 billion per launch.[562] Any claims above that sum would presumably revert back to the licensee.[563] These statutory guidelines, as well as other risk-sharing efforts such as cross-waivers of liability, evolved out of the necessity of the participants in outer space activities to share some of the risks involved.[564] These developments in Space Law establish "a known regime of liability limitation to encourage space exploration and investment by reducing insurance costs and the potential for litigation."[565]

Continued progress modeled on this approach requiring national licensing and insurance coverage for private space entities looks to be a step in the right direction for

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[559] Maniatis, *supra* note 265, at 390.
[560] *Id.* at 390-91.
[561] *Id.*
[562] *Id.*
[563] *Id.* at 392.
[564] Paul B. Larson, *Cross-Waivers of Liability*, 35TH COLLOQ. L. OUTER SPACE 91 at 95 (1992).
[565] *Id.*; 56 Fed. Reg. 48430.

Orbit Law – requiring each space actor to assume responsibility commensurate with their level of involvement in the space activities. Progression from this starting point is also in line with the current Space Law regime ultimately holding the State participant(s) responsible for these activities.

However, as more non-governmental entities commercially participate in and benefit from space activities, Orbit Law agrees with the position that it is mandatory for these enterprises to eventually accept and respond to their own international liability and relieve the "launching State" from the onus of this entire burden.[566] "How to split such responsibility and which aspects should remain with the relevant State in terms of supervision may be debatable, but at least the economic responsibility and potential liability for damages to third parties resulting from private launch activities should be imposed on the private entity."[567] This suggestion should come as no surprise, as the liability of entities providing capital in normal corporate structures is usually limited to the extent of their capital contribution,[568] while the Liability Convention also calls for the apportionment of damages between liable States.[569] It therefore stands to reason that in the eventual progression of Orbit Law, States would remain responsible for State action in outer space, while industry would be responsible for its own private actions. Where there is a consortium of State(s) and/or private parties sharing roles in the dispatch of space objects, even the existing Liability Convention could be used as a point-of-reference to apportion liability among *all* interested actors (eventually including State and

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[566] Rochus Moenter, *The International Space Station: Legal Framework and Current Status*, 64 J. AIR L & COM. 1033 at 1051-52 (1999).
[567] *Id.*
[568] Francis Lyall, *Privatization, Jurisprudence and Space, in* 42ND COLLOQ. L. OUTER SPACE 149 at 150 (1999).
[569] Liability Convention, supra note 144, art. IV, para. 2.

non-State).[570] These notions pose a groundbreaking departure from the imposition of (only) State responsibility and liability in the Outer Space Treaty and Liability Convention, but are now called for given the fundamentally different landscape between the time of these treaties' inception and today's space activities.

When examining these proposals, one might question the necessity for reducing or removing sole-State responsibility from its present prominence within Space Law. As provided in the Outer Space Treaty and seen in the U.S. Commercial Space Launch Acts, the current method of holding the "launching State(s)" responsible for all space activities, and thus placing the burden on those States to ensure the accountability of its corporations, does not appear to be overly taxing on States and actually seems to support private space activities. However, the author envisions that as more and more private parties undertake flights into space, the ability of States to monitor all suborbital and orbital flights, and the effectiveness of State supervision over such multinational ventures, will be diminished. Some corporations might even resort to incorporating or launching only from certain States with lax supervisory standards or ambiguous domestic laws in an effort to avoid any blame for suborbital or orbital flight accidents (much like the comparable maritime problem of "flags of convenience"). Furthermore, many developing countries might not have a mature domestic Space Law program requiring private insurance or other reimbursement schemes for ill-fated corporate space activities, imposition of appropriate safety standards or careful supervision of commercial launch activities. Yet under the current method of Space Law "justice," only that State (and possibly any joint launching State(s)) would be responsible for compensation if an orbital (and eventually suborbital) flight accident had launched from that State. The current

[570] Liability Convention, *supra* note 144, arts. IV, V.

method of holding State(s) absolutely liable under the Liability Convention for damage on Earth, or even fault-based liability for space damage, does not properly apportion blame among *all* potentially responsible parties, and is not an equitable method for assigning fault and restitution.

Again, my proposal for Orbit Law's is a cohesive safety administration that will provide an excellent cornerstone to build a unified suborbital and orbital legal structure. Another method to address these concerns with State and private accountability would be to update the definition of "launching State" under the Outer Space Treaty and Liability Convention so as to hold private entities answerable for their space activities, and thereby require those States of incorporation to update their national laws to ensure shared responsibility. While modification of the term "launching State" might indeed be desirable, the author believes the preferred method for ensuring accountability would be through the establishment of a new international regime binding the liability of each space participant to their involvement in the space endeavor. Orbit Law should be the mechanism for such answers and clarifications.

Many of the concerns with the current Space Law regime and its methods of addressing liability also stem from the "victim orientation" of the existing space treaties.[571] This disposition is especially prevalent in the Liability Convention, where the effort to ensure compensation to victim States prevails, rather than emphasizing a certain, predictable, and equitable framework in which space business activity can be undertaken.[572] Maniatis champions the same risk allocation scheme that Orbit Law eventually proposes: "[T]his fundamental flaw can be resolved in a manner that responds

[571] Maniatis, *supra* note 265, at 379.
[572] *Id.*

to the trends mentioned above: by abolishing the current system of State responsibility for private activities and, at the same time, unifying the private laws of States that apply to the situation of damage caused by space objects....(By) harmonizing the applicable national laws, the redundancy and uncertainty of the current system would be avoided....After all, this approach is not novel. It has been applied successfully to the neighboring field of Air Law where, both with respect to liability for damage to persons and goods on aircraft or on the ground, private carriers are held directly liable according to a harmonized web of national laws."[573] Frans von der Dunk shared these same views:

> When liability as a mechanism is transferred to the international inter-State level, it can take two fundamentally distinct forms. The first is a simple elevation of civil or private liability to the international level, or more exactly, adding transboundary aspects to the liability of (private) legal persons. The entity actually causing the damage is still held liable in those cases of transboundary damage. These treaties essentially are treaties of private international law, obliging the State parties, where necessary, to harmonize their national legislation with respect to cases involving liability respectively to establish such legislation in line with the requirements provided for by treaties. Under international Space Law on the contrary international liability took on the second form: an elevation of the system of liability as a whole to the international level, with the subjects of international law – the States – themselves as the liable entities.[574]

Von der Dunk later proposed two potential options to solve these uncertainties and link international liability and national liability:

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[573] *Id.* at 399-400.
[574] Frans G. von der Dunk, *Commercial Space Activities: An Inventory of Liability – An Inventory of Problems*, 37TH COLLOQ. L. OUTER SPACE 161 at 164 (1994).

> Firstly, a generally accepted and very broad definition of liable State would be accepted. It should include in the term "State" those private entities with the nationality of that State, for purposes of launching, procuring launches and lending facilities for launches. Secondly, an amendment creating direct private liability under international Space Law would prevent national authorities from applying, consciously or unconsciously, their own, far from harmonized interpretations by means of national law. Solving this problem should be given a high priority, before more and more States will find themselves confronted with the potential consequences of the ongoing privatization of space. They will then perceive a need to issue national regulation vis-à-vis private enterprise without any authoritative international guidance as to its scope and contents. The result may be not just gaps and overlaps, but "flags of convenience," "license shopping" and a growing disinterest in taking care of liability issues altogether.[575]

Although linking the nationality of private entities to that of the State for liability purposes is one solution proposed above, the question of liking nationality to spacecraft remains unresolved.

For whatever reasons, States have so far refrained from conferring nationality to spacecraft.[576] This thesis will not enter the debate over whether assignment of nationality to space objects (suborbital or orbital) would be another useful method for vetting liability. Rather, a summary of Orbit Law's position is simply that liability be apportioned between all parties (State and/or private) who maintain some interest in the space object in question. The current Space Law regime of sole State responsibility and

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[575] Frans G. von der Dunk, *The 1972 Liability Convention – Enhancing Adherence and Effective Application*, 41[ST] COLLOQ. L. OUTER SPACE 366 at 372 (1998).
[576] Cheng, *Nationality for Spacecraft? supra* note 309, at 482.

liability does not seem equitable; unless the State is truly the sole actor in its space missions, inconsistent and uncertain methods of assigning private party accountability hamper both the private party's involvement and their cooperation with the parent State and other States.

But States need not be removed entirely from the Orbit Law equation. If the State does maintain a role in supervising private industry, such as safety oversight, manufacturing standards, personnel qualifications, licensing, etc., and some amount of State fault contributed to an accident, then the State might be enjoined with any involved private entities for international liability and responsibility. State jurisdiction over private entities, and State imposition of national laws to ensure private party responsibility, might also be a necessary hold-over from existing Air Law and Space Law methods of accountability for wrongs and accidents. For example, contemporary Space Law often results in the "launching State(s)" requiring its private companies to reimburse third parties for any damage resulting from its space activities; there exists no international body with jurisdiction over private space activities. Perhaps a more effective approach would be to expand Orbit Law's scope of coverage to include jurisdiction over all suborbital and orbital flights, be they *public or private*.

As discussed in the previous Section B., some aspects of the application of Air Law to suborbital flights, and its eventual transition to "Orbit Law," might also be considered for orbital flights. One aspect of this notion that could prove especially effective includes the Montreal Convention's establishment of a set amount of first-tier liability (e.g. 100,000 SDRs), and a first-tier determination of fault closely akin to a blending of the notions of strict liability and *res ipsa loquitur*. Furthermore, any

imposition of damages in Orbit Law *above* the first tier would require substantiation just like the current Air Law regime.[577]

Although suborbital and orbital flight would both likely qualify as inherently dangerous activities, and thereby a subcomponent of inherently dangerous space activities,[578] the Liability Convention's imposition of "absolute liability"[579] needs curtailment if Orbit Law is expected to flourish. Absolute liability is a term of art found in the Liability Convention, and while similar to strict liability, has fewer exceptions and stricter application than true strict liability.[580] Instead, some combination of strict liability and *res ipsa loquitur* for all suborbital and orbital flight liability determinations would likely meet the dual interests of victim protection and industry/insurance stability. Although the historical imposition of strict liability for inherently dangerous activities might be well-founded, one other proposal that Orbit Law might consider over time would be to eventually apply *fault*-based liability for *all* suborbital and orbital flights. This suggestion would closely resemble the second tier liability scheme of the Montreal Convention (albeit the Montreal Convention does have a basis of presumed negligence with a reversed burden of proof),[581] and already comport with the existing rule for all space-based accidents under Article III of the Liability Convention.[582] Determination of whether a true fault-based system (i.e. Liability Convention) or a presumptive negligence system (i.e. Montreal Convention) is more effective may be tested over time as Orbit Law

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[577] Dempsey & Milde, *supra* note 207, at 183.
[578] Carl Q. Christol, THE MODERN INTERNATIONAL LAW OF OUTER SPACE 59 (1984).
[579] Liability Convention, *supra* note 144, art. II.
[580] Ram S. Jakhu, *Space Law: General Principles Lecture Notes*, (Faculty of Law, McGill University, 13 November 2006).
[581] Dempsey & Milde, *supra* note 207, at 182.
[582] Liability Convention, *supra* note 144, art. III.

transitions from Air Law for suborbital flights, and Space Law for orbital flights, to the ultimate Orbit Law gambit of liability.

Analysis of whether punitive damages for deliberate malfeasance should be authorized is another area for consideration as Orbit Law matures. Although insurance premiums would certainly escalate if this proposal were approved, one must weigh whether such penalties would have the desired deterrent effect on those who might consider neglecting suborbital or orbital flight safety. And as discussed under Chapter I, a closer examination of what additional "damages" might be included in this new compensation design (e.g. mental injuries, financial losses, pain and suffering, etc.) must also be performed. Again, a risk-benefit analysis by those eventually drafting an Orbit Law treaty must determine whether restitution for all possible losses outweighs the need for stable and affordable insurance and liability planning.

In summary, existing Air Law and Space Law seems to display a trend of greater "protection" for more terrestrial or near-space damages; air accidents are provided recovery under the Montreal Convention, while space objects causing damage on Earth or to aircraft in flight are provided recovery under the Liability Convention. Both systems appear to be designed as a method for victim-oriented restitution. But if Air Law currently follows a pattern of *res ipsa loquitur* and presumptive fault for its liability determinations, yet space launches impose a stricter standard of "absolute liability" under the Liability Convention, one must ask why there is such a difference, especially in light of the merging air and space capabilities of hybrid craft? Of greater concern is the lower standard for liability determinations when an object finally reaches space – Article III of the Liability Convention allows recovery under a fault/negligence-based system. Rather

than having three separate designs for recovery (airspace under Montreal, "near" space under Article II of the Liability Convention, and outer space under Article III of the Liability Convention), why not apply some combination of strict liability and *res ipsa loquitur* as discussed above for all suborbital and orbital flights? Or as another alternative, why not consider simple fault-based/negligence-based liability for all flights? Tiers of recovery might also be contemplated and modeled after the Montreal Convention, and perhaps even ceilings of liability as mentioned in the discussion of the U.S. Commercial Space Launch Act. Whether liability above certain set amounts would revert back to the State or remain with the private entity will likely be the subject of much deliberation and analysis.

Any of these considerations will require new legislation to be drafted as part of Orbit Law's eventual departure from pure Air Law and Space Law, but any or all proposals could also be scheduled for eventual expiration as discussed in the "Sunset Clause" of Section E. Hopefully these thoughts will generate discussion and debate on the best methods of liability determination, which may eventually be applied to both suborbital and orbital flights. A discussion of Orbit Law's reflections on State sovereignty and overflight rights will be reserved for Section E as well. In order to remain focused on what look to be the primary issues of Orbit Law (liability and sovereignty), this thesis does not explore all the nuances of each space treaty (such as the Registration Convention, Moon Agreement, etc.) But as Chapter I discussed, each of these treaties contain some topics of relevance to Orbit Law, which have hopefully been synthesized into these overall discussions. For those other portions of the existing space treaties that are beneficial to an Orbit Law system, Orbit Law could easily embrace and

retain those provisions as part of its maturation process from Space Law to Orbit Law. Not surprisingly, consideration should also be given for their application to inter-orbital flights – the next topic of discussion.

D. Inter-Orbital Flights.

Because there is not yet any data on legal issues facing interplanetary or interstellar missions, not too much can be said about the application of Orbit Law to inter-orbital flights. Nonetheless, the proposals (and flexibility) of Orbit Law should be relevant to these flights as well. The same legal provisions relevant to orbital flights (i.e. application of Space Law, and its eventual transition to Orbit Law) should be considered germane to inter-orbital flights. This identical treatment represents a logical extension of existing Space Law to inter-orbital flight; as such travel becomes more technologically feasible, Orbit Law's growth can envelop any new nuances of inter-orbital flight into its corpus of suborbital, orbital, and inter-orbital laws.

E. Additional Provisions.

1. The New "Open Skies" Proposal.

Orbit Law's analysis of this potentially controversial topic stems from one central question: [I]s State airspace sovereignty an outdated concept? The author believes that perhaps this longstanding notion has outlived its usefulness and applicability in

international law, and that Orbit Law just might be the system to usher in a new era of "Open Skies." There are also multiple bases to support the argument that exclusive State "ownership" over its airspace is no longer applicable. The first of these arguments stems from the numerous and liberal exceptions to the rule of State airspace exclusivity, which now appear to swallow the rule.

The extent of exclusive State sovereignty and any corresponding State action is still limited to that which is permitted under international law.[583] As one example of such limitations on State action, authorization for emergency landing by craft in distress represents a longstanding right in international law.[584] In the *Aerial Incident of 1955*, this case dictated that although aircraft are not specifically permitted a right of entry for distress under the Paris Convention, Article 22 did provide that "[a]ircraft of the contracting States shall be entitled to the same measures of assistance for landing, particularly in case of distress, as national aircraft...," while Article 25 of the Chicago Convention requires that "[E]ach contracting State undertakes to provide such measures of assistance to aircraft in distress in its territory...."[585] Such a "right of entry" therefore means that States must not forcibly prevent a vessel in distress from landing.[586] Although these caveats do not rise to the level of aircraft having an unfettered "right" to enter a State's airspace, States do have an obligation to allow craft in distress to enter.

Further examples of diminished State sovereignty include limited incursions allowed under the Law of the Sea, where both State and merchant ships enjoy a right of

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[583] *Palmas Island Case* (1928), 2 RIAA 821; *Lotus, supra* note 13.
[584] *Memorial of U.K.* (Israel v. Bulgaria; U.S. v. Bulgaria; U.K. v. Bulgaria), 1959 I.C.J. pleadings (*Aerial Incident of 27 Jul. 1955*) 331, 358-9 (Memorial dated 28 Aug. 1958).
[585] *Id.*
[586] Schwartz & Berlin, *supra* note 369, at 702.

innocent passage through a State's territorial seas.[587] Aircraft are also authorized to navigate through international straights and archipelagic sea lanes within State territory under the Law of the Sea.[588] Furthermore, most of the world already enjoys "open skies" *per se*, and although these transit rights are primarily established through bilateral agreements, most restrictions in these agreements focus on commercial activity rather than overflight restrictions.[589] Regarding overflight and its relevance to suborbital and orbital flights, although there is no clear delimitation of the upper limit of national sovereignty, international law and the relevant space treaties make it clear that national sovereignty does *not* extend to outer space.[590] So although the breadth of State sovereignty is currently expansive, it is not exclusive.

Additional reasons for the elimination of airspace sovereignty include historical precedence that any violations of sovereignty do not appear to be a compensable event in international law. While States are liable for violations of international obligations which injure another State, respect for territorial jurisdiction has never been an *erga omnes* obligation.[591] Accordingly, Space Law emphasizes international cooperation rather than compensation for alleged territorial violations. Starting with the Liability Convention, its definition of "damage" appears exhaustive and does not imply any cause of action for trespass *per se*.[592] Its Article I(a) use of the phrase "damage means" rather than "damage includes" indicates a comprehensive listing of possibilities rather than a partial sampling

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[587] *Convention on the Law of the Sea,* 10 Dec. 1982, 1833 U.N.T.S. 3, art 17.
[588] Bin Cheng, *The Commercial Development of Space: the Need for New Treaties, in* STUDIES IN INTERNATIONAL SPACE LAW 648-49 (Bin Cheng, ed., 1997).
[589] Dempsey, *supra* note 158, at 275 *et al.*
[590] Bin Cheng, *From Air Law to Space Law, in* STUDIES IN INTERNATIONAL SPACE LAW 33 (Bin Cheng, ed., 1997).
[591] *East Timor* (Australia v. Portugal), 1995 I.C.J. 90, 214 (Jun. 30).
[592] Schwartz & Berlin, *supra* note 369, at 707, 713.

of compensation options, and was the result of protracted and contentious negotiations negating broader theories of recovery or more expansive definitions of "damage."[593]

As Schwartz and Berlin highlighted in their analysis of the *Cosmos 954* crash on Canadian territory, the legislative history of the Liability Convention indicates a purpose of compensating victims of damage from space objects, not to save plaintiff States from alleged affronts to their dignity for intrusions into their territory.[594] On a similar vein, the Rescue and Return Agreement, and the Outer Space Treaty, emphasize tolerance and international cooperation to resolve instances of unintentional intrusions by space objects, rather than condemning them as violations of State sovereignty.[595] And the Liability Convention focuses on restoration of the victim to their previous status through compensation for physical, material injury; purely symbolic damage is nowhere contemplated as a theory of recovery.[596]

So what is the remedy for unauthorized overflight? Based on the existing Air Law and Space Law treaties and historical precedence, there does not appear to be any formal solution other than diplomatic rhetoric between the offending and offended States. Although ICAO has specifically Stated that there is no right of innocent passage for spacecraft above State territory, there is no proposed outcome if such a flight occurs anyway.[597] Even the United Nations has adopted an "Open Skies" policy in its Principles of Remote Sensing, and although the document is non-binding, its inception signals that a redefinition of traditional sovereign rights is imminent.[598] Satellite orbits cannot be held

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[593] *Id.* at 720.
[594] *Id.* at 713.
[595] *Id.*
[596] Liability Convention, *supra* note 144, art. VIII, XII.
[597] *Draft Brief for the ICAO Observer, supra* note 92.
[598] Susan M. Jackson, *Cultural Lag and the International Law of Remote Sensing*, 23 BROOKLYN J. INT'L L. 853 at 854-55 (1998).

to violate State-sovereign airspace;[599] therefore, the advances in technology coupled with the proposals of Orbit Law seek to "lower the ceiling" of this longstanding principle.

Under current international law, in cases of unauthorized entry into the territory of another State (primarily through aircraft incursions), that "aircraft-intruder's" State of nationality may exercise protective competence through diplomatic intervention.[600] That State can also demand fair treatment of passengers and property, along with their safe return, and (when warranted) compensation from abuse of authority.[601] More importantly, Article 3 *bis* of the Chicago Convention clearly prohibits use of force against civil aircraft for violations of airspace.[602] In fact, international law requires any military response (against aircraft, space assets, or any other potential target) to take into consideration the principles of the Law of Armed Conflict, which include the determination of military necessity, distinction of targeting, proportionality in response, and humanity to reduce and alleviate unnecessary suffering.[603] Although States might certainly share security concerns over unidentified assets entering their airspace, technically Article 51 of the U.N. Charter on its face does not appear to authorize "anticipatory self defense."[604] The plain reading of the text[605] requires that an armed attack first occur before defensive actions are authorized.[606] This requirement is clearly in conflict with many State's defensive policies, but rather than taking an aggressive posture against unauthorized incursions, "Open Skies" under Orbit Law might reduce

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[599] *Id.*
[600] McDougal, Lasswell & Vlassic, *supra* note 21, at 522.
[601] *Id.*
[602] Chicago Convention, *supra* note 157, art. 3 *bis*.
[603] Michel Bourbonniere, *Law of Armed Conflict (LOAC) and the Neutralization of Satellites or "Jus In Bello Satellitis"*, 9-1 J. CONFL. & SEC. L. 43 *et seq.* (2004).
[604] U.N. CHARTER, *supra* note 16, art. 51.
[605] Vienna Convention, *supra* note 286, art. 31(1).
[606] U.N. CHARTER, *supra* note 16, art. 51.

these security concerns and enable a more reasonable response to unexpected or unidentified overflights.

In order to reduce State concerns over national security that Open Skies might bring, reasonable suggestions have been put forth as early as the 1960's:

> [F]or obvious reasons, techniques for the prompt and precise identification of spacecraft are of more urgent importance for both minimum and optimum order than was the case previously with respect to ships and aircraft. It is probable that States will make reciprocal demands for comprehensive and economic systems of identification of space vehicles by means of, for example, assignment of distinct radio signals to each spacecraft, disclosure of orbital and transit characteristics, display of external marks, and other appropriate methods that modern technology and human ingenuity may make available.[607]

Successful methods for identification of aircraft, through registration, nationality marks, route planning, and radio correspondence, have been in place for years.[608] Orbit Law's proposals would utilize modern science enabling States to identify all suborbital and orbital vehicles during flight. With this added assurance and guaranteed method of identification to alleviate State security concerns, Orbit Law would thereby authorize access to all States' airspace by such vehicles. Although suborbital craft will initially be governed by Air Law, they should enjoy Open Skies just as that proposed (and currently in existence) for orbital flights. And once this system was in place, the next logical extension would include Open Skies for aircraft as well, which are already much slower and easier to identify.

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[607] McDougal, Lasswell & Vlassic, *supra* note 21, at 518.
[608] *Id.* at 517-18.

Whether or not prior agreements or bilateral instruments would be required is an item for those drafters of the Orbit Law treaty to examine and negotiate, but the author suggests that true "Open Skies" should not include prior "permission" for overflight that today's bilateral negotiations require. In instances where a suborbital or orbital flight raises some State concern and the craft is not able to be identified or contacted, Orbit Law might authorize the State overflown to intercept, but certainly not engage the craft unless some hostile act was performed by the "intruder." Given today's technical advancements, any obstacle to this program's success is therefore not technological, but rather diplomatic – the difficulty in motivating States to embrace these new proposals.

Are Open Skies really such a controversial proposal for suborbital and orbital flights? The author believes the history of prior space object overflights highlighted in Chapter I suggests that it is already an accepted State practice. If these multiple instances of prior State overflights by objects going into orbit constitute the emergence of customary international law, "[T]he passage of only a short period of time is not necessarily, or, of itself, a bar to the formation of a new rule of customary law."[609] And as referenced in Chapter I, Open Skies comports with the *jus cogens* of freedom of exploration and use of outer space;[610] Orbit Law simply extends its scope of coverage slightly closer to Earth.

In an apt conclusion to this section, Stephen Gorove's article on *Aerospace Objects* provided a preliminary glimpse at what has now taken shape in this thesis' Open Skies proposal:

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[609] *North Sea Continental Shelf* (F.R.G. v. Den./F.R.G. v. Neth.), 1969 I.C.J. 3 (Feb. 20).
[610] Outer Space Treaty, *supra* note 9, art. I.

> Could a State lawfully deny another State's spacecraft the right of innocent passage at a height of 40-90 km in the space above its territory? Would this violate the fundamental freedom of exploration and use of outer space? Should the answer be influenced by an analogy to the law of the sea where, in the absence of mutual agreement or international convention, a land-locked State has no independent right for access to the sea and claim innocent passage through the territory of a coastal State notwithstanding the principle of the freedom of the seas? Should this be our policy choice for interpreting the freedom of exploration and use of outer space enshrined as a fundamental principle in the 1967 Outer Space Treaty? A courageous negative answer to this will be a challenge for air and space lawyers in the 21st century.[611]

Unlike landlocked States under the Law of the Sea, though, every State borders airspace, and thereby outer space. It is therefore in the interest of all States to embrace the notion of Open Skies in a unified effort to "slip the surly bonds of Earth" if we ever hope to "touch the face of God."[612]

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[611] Gorove, *supra* note 82, at 111-12.

[612] John Gillespie Magee, Jr., "High Flight," 03 September 1941,
("Oh! I have slipped the surly bonds of Earth
And danced the skies on laughter-silvered wings;
Sunward I've climbed, and joined the tumbling mirth
of sun-split clouds,—and done a hundred things
You have not dreamed of—wheeled and soared and swung
High in the sunlit silence. Hov'ring there,
I've chased the shouting wind along, and flung
My eager craft through footless halls of air....

Up, up the long, delirious, burning blue
I've topped the wind-swept heights with easy grace
Where never lark nor ever eagle flew—
And, while with silent lifting mind I've trod
The high untrespassed sanctity of space,
Put out my hand, and touched the face of God.").

2. "Sunset Clause" Proposal.

It seems fitting that an analysis of a new air and space regime includes a section on "sunset clauses." However, contrary to this section's title, there is really nothing "space-related" or heliocentric to this proposal. Black's Law Dictionary defines a "sunset clause" as "[A] statute under which a governmental agency or program automatically terminates at the end of a fixed period unless it is formally renewed."[613] In another simple explanation, Wikipedia defines this term as follows: "[I]n public policy, a sunset provision or sunset clause is a provision in a statute or regulation that terminates or repeals all or portions of the law after a specific date, unless further legislative action is taken to extend it. Not all laws have sunset clauses; in such cases, the law goes on indefinitely."[614]

Because the author's detailing of Orbit Law has repeatedly referenced the eventual transition from Air Law and Space Law principles to new Orbit Law principles, the drafters of such a convention might contemplate setting a date certain to "retire" those old standards. If suborbital flights will eventually merge with orbital flights under one cannon of Orbit Law, a timetable for such transition is advisable. Setting such deadlines will prompt those legislators of Orbit Law to continually review and revise this regime to preserve its best aspects, test those theories requiring further analysis, and jettison any tenants which are not conducive to the success of the program.

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[613] BLACKS LAW DICTIONARY, *supra* note 320.

[614] _____. "Sunset provision" *Wikipedia the Free Encyclopedia* (redirected from Sunset clause) online: Wikipedia.org <http://en.wikipedia.org/wiki/Sunset_clause>.

CONCLUSION

Has the time finally come to reevaluate the legal dicta of International Air Law and Space Law, or are these current systems and the rhetoric that have evolved little over the past four decades sufficient to cabotage the weighty cargo of the existing Air and Space treaties on their journey into the twenty-first century? The numerous and rapid scientific and technological advancements being made lend support to the notion of change, rather than maintaining the *status quo*. The functional versus spatial debate over demarcation of airspace and outer space was a logical bifurcation of solutions in the early days of space flight. But the blending of airspace and outer space through the advent of hybrid flight vehicles, and a recommendation to envelop *all* flights into one overarching legal system based on *orbital* status, seems to be the next logical step in the evolution of flight.

Although the ability to traverse air and space were inventions of the 20th century, State apprehension with these new abilities stemmed from deeply-rooted notions of sovereignty and concerns over liability. International Air Law has only recently modernized its methods for holding air carriers accountable for accidents, but continues to adhere to strict protection of a State's airspace as sovereign territory. Space Law, on the other hand, continues to struggle with inconsistent liability determinations for damage occurring on Earth versus outer space, while emphatically proclaiming freedom of outer space as *jus cogens*. This thesis' newly-proposed legal regime called Orbit Law proposes to distill the best applications from existing Air and Space treaties and jurisprudence, and slowly siphon these relevant components away from the separate International Air Law and Space Law systems into one eventual Orbit Law system.

I propose that Orbit Law should initially include the application of existing principles of International Air Law to all suborbital flights, while current Space Law principles will govern all orbital and inter-orbital flights. Drafters of this new treaty regime will examine which systems of liability best promote the growth and development of suborbital and orbital flights, determine how to minimize flight risk through the initiation of an international safety system, and promote "Open Skies" through the dissolution of sovereign boundaries for all such flights. The author believes that some blending of strict liability and *res ipsa loquitur* represents the most equitable method to hold all involved parties (State and private) liable and responsible according to their degree of involvement in any flight accident. Over time the separate legal structures applicable to suborbital and orbital/inter-orbital flights will be tested to determine the most successful and useful configurations, and ultimately united into a fine-tuned international treaty. By apportioning responsibility under one unified liability regime, advancing Open Skies by utilizing technology to quickly identify all suborbital and orbital craft, and applying the Rescue and Return Agreement and other international safety standards to all flights, the evolution of Orbit Law will advance State and corporate participation across all frontiers of flight.

Should States eventually embrace these suggestions, they will have the benefit of being able to pick and choose those solutions that they believe would work best for suborbital, orbital, and inter-orbital flights. Inclusion of a "Sunset Clause" in Orbit Law will also give them the hindsight to retain, modify, or jettison any principles depending on their degree of success in the early years of application.

Quod Erat Demonstrandum

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