LEGAL ASPECTS OF REUSABLE LAUNCH VEHICLES

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I. INTRODUCTION

Since ancient times, humans have been the only species on Earth fascinated with the idea of traveling beyond the planet. Although nearly all uses of rockets up to the twentieth century were for warfare or fireworks, there is an interesting old Chinese legend that reports the use of rockets as a means of transportation. According to the legend, around the 16th century a Chinese official named Wan-Hu, which roughly translates as Crazy Fox, built a rocket powered flying chair in order to fly to the moon. Attached to the chair were two large kites. Fixed to the kites were forty-seven fire arrow rockets.

The Chinese official climbed into the chair and forty-seven assistants, each with a torch, lit the fuses of the fire arrow rockets. There was a blast-off and tremendous explosion, along with great clouds of smoke. After the smoke cleared, Wan-Hu had vanished; the assistants indeed believed that he was up there among the stars. History does not say what happened to Wan-Hu, but only the worst can be assumed. The fire arrows he used were as likely to explode as they were to fly. Whether this happened or not, Wan-Hu did make it to the Moon, as a crater on the Moon is named after him. Historian William E. Burrows said, "If it really happened, Wan-Hu had the triple distinction of being the first person to ride a rocket, the first to fly on a self-propelled, heavier-than-air device, and the first rocket pilot to get killed during a test flight."[1] Nevertheless, the ambition for space travel has never diminished and the dream of Wan-Hu

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[1] WILLIAM E. BURROWS, THIS NEW OCEAN: THE STORY OF THE FIRST SPACE AGE 21 (Random House ed., 1st ed. 1998).

became a reality when Neil Armstrong uttered his famous words from the lunar surface, "That's one small step for a man, one giant leap for mankind."[2] Today, people are becoming more dependent on critical technologies that require space transportation systems, including telecommunications, navigation and weather monitoring. Why has that dependency not extended to space transportation systems for other applications such as passenger and cargo transportation? The reason is simple: the space transportation systems that we have used so far are expendable and thus too expensive to operate. To become dependent on space transportation vehicles, a reusable space transportation vehicle needs to be developed, just like an aircraft. The primary difference being that a reusable space vehicle can operate in both outer space and airspace. To reflect this dual use, an appropriate title such as aerospace plane should be used.

The aerospace plane, which is a reusable launch vehicle (RLV), might seem like something of the future, but it is not. There are two types of aerospace planes. The first, the orbital type, is designed to orbit the Earth and it is more a spacecraft than an aircraft. The only orbital RLV ever developed was the *Space Shuttle*, which in fact is partly an RLV because its external tank is expendable, and after the February 1, 2003 *Columbia* accident, its days seem numbered. The second type is the suborbital RLV. This type of vehicle is not a novelty, as it has been around for more than forty years. The *X-15* of the United States was the first suborbital aerospace plane. It traveled to altitudes beyond 100 km at over six times the speed of sound.[3] Currently, there are nations and private companies working on different prototypes of suborbital RLVs that soon will be flying in the skies and beyond.

In practice, the aerospace plane will operate in both airspace and outer space, but currently there is no international legal regime that would specifically apply to them. The regime

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[2] NEIL ARMSTRONG ET AL, FIRST ON THE MOON, 321 (Little Brown and Company, ed., 1970).

[3] U.S. OFFICE OF SPACE COMMERCIALIZATION, DEP'T OF COMMERCE, SUBORBITAL REUSABLE LAUNCH VEHICLES AND APPLICABLE MARKETS 11 (2002), *at* http://www.technology.gov/Space/library/reports/ 2002-10-suborbital-LowRes.pdf (last visited June 28, 2005).

for air transportation is very different and sometimes opposite to the one for the activities of outer space. An example is liability. Under the Convention on the International Liability for Damage Caused by Space Objects,[4] a State can be "liable...due to its fault" if damage occurs "elsewhere than on the surface of the Earth"[5] and absolutely liable if it occurs "on the surface of the Earth."[6] In addition, the launching State is liable, and unless otherwise provided for by contract, not the launch service provider. Whereas under the Convention for the Unification of Certain Rules Relating to International Carriage by Air,[7] applicable to air transportation, the liability is upon the air carrier without regards to the owner of the carrier and strict liability is the norm. Thus, it is very important that work begins on establishing a flexible legal foundation for an international regime that will apply to both aircraft and spacecraft. In the alternative, those reusable space transportation systems, or aerospace planes, that are going to operate in sub-orbit to carry us from one point on the Earth to another can be incorporated into the current international air law regime.

Additionally, there are three very good reasons to believe that aerospace planes are going to be part of the near future. First, private industry is very involved. The Space Transportation Association (STA)[8] is similar to what the International Air Transport Association (IATA) is to airline industry, and some of STA's members, like Boeing and Lockheed-Martin, are very important players in space technology development. Second, there is private investment by wealthy entrepreneurs like Jeff Bezos, Elon Musk, Paul Allen and Richard Branson among others, who are investing huge amounts of money in space projects and ve-

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[4] Convention on the International Liability for Damage Caused by Space Objects, *opened for signature* Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention].

[5] *Id.* at art. III.

[6] *Id.* at art. II.

[7] Convention for the Unification of Certain Rules for International Carriage by Air, May 28, 1999, (entered into force Nov. 4, 2003) [hereinafter Montreal Convention] *available at* http://www.jurisint.org/pub/01/en/doc/417_1.htm (last visited July 1, 2005).

[8] *See* Space Transportation Association website, *available at* http://www.spacetransportation.us/ (last visited April 23, 2005).

hicles.[9] Finally, the United States, one of the biggest space powers and certainly the one with the largest space budget, is very interested in commercial reusable space transportation and is supporting efforts in the development of these systems.

Within the Federal Aviation Administration (FAA), the United States Government created an office of space transportation[10] that, in turn, has enacted regulations for reusable space transportation systems, and has even published various studies and reports regarding aspects like liability and the impact and benefits on the economy of these systems. Additionally, the Department of Commerce and the National Aeronautics and Space Administration (NASA) have created offices of space commercialization. The purposes of these offices are to ensure the growth and international competitiveness of the United States commercial space industry, including the RLV. The United States government is providing funds for this growth in the way of government contracts for the development of these space transportation systems.[11] These reasons provide enough support to conclude there is a need to determine the international legal status of these reusable space transportation systems, and to decide if there should be an eventual adoption of a new inter-

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[9] *See* Brian Berger, *2004: The Year Space Tourism Finally Took Off*, SPACE NEWS, Dec. 29, 2004, *at* http://www.space.com/spacenews/business_tourism2004_041229.html (last visited June 29, 2005).

[10] The office is called the Associate Administrator for Space Commercial Transportation (AST), more information *available at* http://ast.faa.gov/ (last visited April 23, 2005).

[11] On its official website, the FAA-AST stated that: "The U.S. government does not directly subsidize the industry. However, the government recognizes the importance of space launch capability to science, military defense, communications, and the U.S. economy. As a result, the government supports the development of new vehicles and vehicle technologies. Examples of U.S. government programs intended to spur private sector development of new space vehicles and technologies include the Air Force's Evolved Expendable Launch Vehicle program and NASA's Space Launch Initiative. Monies for developments under these programs have been awarded to companies on a competitive basis and as a result of a specific U.S. government solicitation. Other federal government support for the commercial launch industry includes Air Force maintenance of federal launch ranges, which host many commercial launches, and financial backing in the case of excessive third-party claims for damages in the case of a commercial launch-related accident." Associate Administrator for Commercial Space Transportation, *About Commercial Space Transportation: FAQs*, *available at* http://ast.faa.gov/aboutcst/faq.htm (last visited July 17, 2005).

national regime or the incorporation of such vehicles into a current regime.

In the first section, the current and future legal status of aerospace planes will be examined under the applicable international law, mainly the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies[12] and the Convention on International Civil Aviation.[13] This section will also include the boundary issue, which consists of determining the delimitation of airspace and outer space. It will also address the spatial versus functional approaches to this issue. In the second section, liability and risk management issues of aerospace planes and other RLVs will be examined, paying particular attention to the Liability Convention[14] and the Montreal Convention,[15] as well as the national provisions of different nations regarding liability in space. The third section will include conclusions and recommendations.

II. LEGAL ASPECTS OF THE AERSOSPACE PLANE AND OTHER REUSABLE LAUNCH VEHILCES

The RLV presents a legal challenge to the current international air and space law regimes. The legal differences of these two regimes are in terms of sovereignty, property rights, transit rights and liability consequences. In this section, the issue of delimitation of outer space and airspace and its relation to RLV operations will be addressed. The possible integration of the aerospace vehicle into the current international legal regime of air law and the need to establish a space transportation organization for orbital RLVs will also be discussed.

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[12] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

[13] Convention on International Civil Aviation, Dec. 7, 1944, 61 Stat. 1180, 15 U.N.T.S. 295 [hereinafter Chicago Convention].

[14] Liability Convention, *supra* note 4.

[15] Montreal Convention, *supra* note 7.

A. Delimitation of Outer Space and Airspace

The first article of the Chicago Convention firmly establishes the sovereignty of States over the airspace above their territories.[16] This principle has been paramount to the development of international air law and contrasts sharply with the regime for outer space. The Outer Space Treaty establishes the now international customary law principle of free space, which means that outer space is not subject to any claims of sovereignty or national appropriation.[17] These two different international regimes have created what some authors have called the "boundary problem".[18] This problem is the ongoing dispute of determining when airspace ends and outer space begins. Generally, the main issue is whether a boundary should even be established. Robert F.A. Goedhart summarizes the reasons for and against establishing a boundary.[19] Some of the reasons he presents against establishing a boundary include:

- Despite the lack of a boundary no international disputes have arisen so far;
- Delimitation attempts by means of a multilateral treaty would probably encourage some States to make excessive territorial demands;
- The boundary might be established too high so that several space activities could be hampered;
- Agreement on fixing the boundary at a lower altitude will definitely not lessen the fear of some States that their interests may come under threat;

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[16] "The contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory." Chicago Convention, *supra* note 13, at art. 1.

[17] "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." Outer Space Treaty, *supra* note 12, at art. II.

[18] BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 425 (Clarendon Press, 1997).

[19] ROBERT F.A. GOEDHART, THE NEVER ENDING DISPUTE: DELIMITATION OF AIR SPACE AND OUTER SPACE (Editions Frontières, 1996).

- Once a particular altitude is settled on, it will be very hard to reconsider that decision, especially if the boundary has to be lowered. Many States would of course be opposed to the reduction of its sovereign air space.[20]

Goedhart also presents some reasons for establishing a boundary between airspace and outer space, and these include:

- An international agreement on such a boundary would weaken the position of those States unfoundedly claiming the entire Earth's atmosphere above their territory to be national air space;

- A different interpretation of the present space treaties, denying for example the freedom of space exploration and space exploitation, could lead some States to detect 'air space violations' as a pretext for frustrating space activities of other States;

- Disputes over the extent of air space may create a lot of tension between States and at worst bring about the outbreak of war;

- Determining an upper limit of air space could further the development of space technology. [21]

Accordingly, these two different visions of dealing with the boundary problem each have a group of followers. Those who advocate establishing a defining line between airspace and outer space are called "spatialists". Those who argue that no definitive line should be established are called "functionalists".[22]

1. The Spatial Approach

The spatial approach, which "favors the establishment of a demarcation line between air and outer space",[23] would mean

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[20] *Id.* at 6-7.

[21] *Id.* at 7-8.

[22] *See* CHENG, *supra* note 18, for a more detailed discussion between the functional and spatial approach to the boundary issue.

[23] Katherine M. Gorove, *Delimitation of Outer Space and the Aerospace Object – Where is the Law?*, 28 J. SPACE L. 11, 16 (2000).

that "when the aerospace plane is above the imaginary line and having orbital capabilities it is to be treated as a space object. When below the line the aerospace vehicle would be treated as an aircraft."[24] This approach means that for future RLVs, whether orbital or suborbital, two different legal regimes would apply to the same vehicle depending on its location: the airspace regime when below the line and the outer space regime when operating above it. This is already the reality in Australia, the only country so far to adopt a spatialist approach to the boundary issue. In 2000, the Australian government amended its Space Activities Act to require a space license for any vehicle flying higher than 100 km of altitude above mean sea level.[25] This means, for example, that if an aerospace plane is being operated to or from Australia and an accident occurs, both the Liability Convention [26] and the Montreal Convention [27] might apply, depending on where the vehicle is located. Some countries, like South Korea and Argentina, have argued that this approach would make it easier to decide the law to be applied if an accident occurs.[28] However, it could make determining applicable law more confusing because it may be difficult to determine where the accident occurred, especially if it occurred near the boundary. Another problem under the spatialist approach is that it maintains two different legal regimes operating at the same time for the same vehicle. This is not a major problem now, but in the future when aerospace planes and RLVs are more common, the idea of having two different regimes applying to the same vehicle might not be the best option. Most of those that favor the spatialist view argue that governments will have to create new international institutions to deal with hybrid vehicles, like aerospace planes. Some governments argue for new institutions because they "favour separate legal regimes based

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[24] Carl Q. Christol, *Legal Aspects of Aerospace Planes*, *in* THE HIGHWAYS OF AIR AND OUTER SPACE OVER ASIA 77, 83 (Chia-Jui Cheng & Pablo Mendes De Leon eds., Martinus Nijhoff Publishers, 1991).

[25] Space Activities Act of 1998, § 8 (Austl.) (as amended through 2000).

[26] Liability Convention, *supra* note 4.

[27] Montreal Convention, *supra* note 7.

[28] Gorove, *supra* note 23, at 18.

on a determined boundary."[29] States would have to draft treaties and create an international organization similar to the International Civil Aircraft Organization (ICAO). However, this approach creates problems of logistics and communications that might affect safety issues. For example, if countries adopt the spatialist approach and an aerospace vehicle starts operating under two different legal regimes, it would have to be certified to operate under both regimes. It will have to comply with the current international standards and recommended practices (SARPs) of international air law[30] as well as the future standards and practices that countries adopt for outer space vehicles. This of course is not very practical. It is better to incorporate aerospace planes into the current air law system by amending the current rules rather than creating new ones.

On the other hand, it is easier to deal with traffic rights under the spatialist approach. For example, if the spatialist approach were adopted,[31] a flight from New York to Moscow would not be required to obtain over-flight traffic rights for those portions of the flight that an aerospace plane is above 100 km. In this case, the vehicle would be in outer space, where sovereign overflight permission is not required. It could also be in sovereign airspace where innocent passage is already permitted to commercial aircraft under the Chicago Convention,[32] and aerospace planes would only need to be incorporated into to this regime. The same situation would exist for an orbital RLV during re-entry operations, especially if it was launched from a country that is landlocked or partially landlocked.

In general, the spatial approach is not very practical, as having a vehicle operating under two legal regimes at the same time might create confusion. An approach that requires two le-

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[29] Christol, *supra* note 24, at 84.

[30] Chicago Convention, *supra* note 13, at art. 37 (referring to adoption of international standards and procedures through Annexes to the Chicago Convention).

[31] For example, if the international community follows Australia's lead and adopts 100 km as the international boundary between airspace and outer space.

[32] Chicago Convention, *supra* note 13. Article I of the International Air Services Transit Agreement permits the innocent passage of foreign aircraft over another's State territory. International Air Services Transit Agreement, Dec. 7, 1944, art. I, *available at* http://www.iasl.mcgill.ca/airlaw/public.htm#chicago (last visited July 17, 2005) .

gal regimes would also probably hinder aerospace plane traffic management and navigation services. Maintaining two separate legal regimes has worked very well until now, but as technological advances develop, the need for a static defined boundary between airspace and outer space seems less relevant. This does not mean that the space treaties can be disregarded and the air treaties merely amended to incorporate these vehicles. Establishing a boundary will make it more difficult to harmonize the airspace and outer space legal regimes in order for them to work in unison.

2. The Functionalist Approach

The functionalist approach, on the other hand, "entails the application of laws, regardless of where they may take place."[33] This means that functionalists "place emphasis on the activity or activities of vehicles"[34] rather than on where the vehicle is located. In this sense, this approach seems more adaptable to aerospace planes and suborbital RLVs in general, because under the functionalist view a single legal regime can be chosen instead of having to apply two. This approach is also the most popular amongst most of the States that recently took part in a questionnaire conducted by the Committee on the Peaceful Uses of Outer Space (UNCOPUOS) of the United Nations.[35] Although, most States also stated that "it would be necessary to analy[z]e the technical aspects of air and outer space transport systems and the means of delivery of objects into outer space, prospects for the development of aerospace objects capable of missions in air and outer space, as well as data on the use of the

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[33] Henri Wassenbergh, *The Art of Regulating International Air and Space Transportation: An Exercise in Regulatory Approaches to Analyzing Air and Space Transportation*, XXIII ANNALS AIR & SPACE L. 201, 206 (1998).

[34] Christol, *supra* note 24, at 84.

[35] *Questionnaire on Possible Legal Issues with Regard to Aerospace Objects*, U.N. COPUOS, 38th Sess., U.N. Doc. A/AC. 105/C.2/1995/CRP.3/Rev. (1995), *available at* http://www.oosa.unvienna.org/aero/ (last visited July 6, 2005). For a detailed summary of the States' replies to the Questionnaire, see *Report of the Legal Subcommittee on the Work of its Forty-Second Session* UN COPUOS, 42d Sess., UN Doc. A/AC.105/805 (2003), *available at* www.space.gov.za/COPUOS-GA.html (last visited July 6, 2005). *See also* Gorove, *supra* note 23, at 18.

only existing prototype of such an aerospace object, namely, the Space Shuttle."[36] Many scholars who have written on the topic also favor the functionalist approach.[37]

While the functional approach seems more adaptable to aerospace planes and RLVs in general, one major fault that this approach has is that with no defining line, different States could have different sovereignty claims in what other States might consider outer space. One clear example is the United States and its current space policy.[38] The United States, as a big supporter of the functionalist view, has always considered establishment of a defining line between airspace and outer space would limit their space operations and policies.[39] Indeed, the

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[36] *Report of the Legal Subcommittee on the Work of its Forty-Second Session* UN COPUOS, 42d Sess., *supra* note 35, at 13.

[37] Some scholars have adopted a functionalist approach early in the discussion of the boundary problem. *See* MCDOUGAL ET AL., LAW AND PUBLIC ORDER IN SPACE (Yale University Press, 1963). Others include Wassenbergh who specifically stated that "the functionalist approach is especially apt" for reusable launch vehicles, *see* Wassenbergh, *supra* note 33, at 207. Scholar S.B. Rosenfield also has stated "the current functional approach to outer space is solving all [boundary] problems." *See* S.B. Rosenfield, *Some Thoughts on the Distinction between Air Space and Outer Space, in* 26 COLLOQUIUM ON THE LAW OF OUTER SPACE 93 (1983).

[38] The January 6, 2005 Fact Sheet for the January 21, 2004 "U.S. Space Transportation Policy" establishes that assured access to space "is a requirement for critical national security, homeland security, and civil missions and is defined as a sufficiently robust, responsive, and resilient capability to allow continued space operations, consistent with risk management and affordability", *available at* http://www.ostp.gov/ (last visited April 3, 2005).

[39] The United States statement on the Definition and Delimitation of Outer Space And The Character And Utilization Of The Geostationary Orbit before the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, 40th Session states in part:

> With respect to the question of the definition and delimitation of outer space, we have examined this issue carefully and have listened to the various statements delivered at this session. Our position continues to be that defining or delimiting outer space is not necessary. No legal or practical problems have arisen in the absence of such a definition. On the contrary, the differing legal regimes applicable in respect of airspace and outer space have operated well in their respective spheres. The lack of a definition or delimitation of outer space has not impeded the development of activities in either sphere. We have not been persuaded by the reasons put forth for undertaking such a definition or delimitation. For example, some delegations support the notion of such a definition for its own sake. But without a practical problem to address, undertaking such a definition would be a risky exercise, as explained more fully below. Other delegations suggest that a definition or delimitation is somehow necessary to safeguard the sovereignty of states. However, we are aware of no issue

United States has asserted that it will deny space to other States, if required, in order to advance its interests in space.[40] This is why some States, especially those without space capabilities; prefer to choose the spatialist view. Prof. Christol explains other drawbacks of the functionalist approach in the following:

> To facilitate the legal controls over such vehicles, presumably in the interests of simplicity, this approach [functionalist] has called for a single law regime. Proponents argue that since the principal goal of this vehicle is to be in orbit it should be governed by a unitary regime rather than by separate space and air law regimes.[41]

Although a unitary regime might be the best solution for suborbital RLVs, in particular for aerospace planes, it might not be the best solution for orbital RLVs which most of the time will be operating in outer space. Outer space is not subject to sovereign control and it would be very difficult, if not impossible, to implement a regime for outer space like the one for aviation,

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> of state sovereignty that would be solved by defining outer space. Even if there were a problem the resolution of which a definition or delimitation of outer space would help to address, the Legal Subcommittee should still proceed with all due caution. Whatever definition or delimitation were ultimately agreed upon would by its nature be arbitrary at worst, or, at best, be constrained by the current state of technology. For example, technological advances have increased the height at which aircraft can sustain flight, while they have decreased the height at which the orbital flight of space vehicles is possible. These technological advances will likely continue. It would be dangerous for the Legal Subcommittee to agree to an artificial line between air space and outer space, when it cannot predict the consequences of such a line. Mr. Chairman, to conclude with respect to the definition or delimitation of outer space, our position continues to be that the Legal Subcommittee should not take on this issue until practical problems have been identified so as to make it absolutely necessary to do so.

For the complete statement *see* OFFICE OF THE LEGAL ADVISER, DEP'T OF STATE, U.S. Statement, Definition and Delimitation of Outer Space And The Character And Utilization Of The Geostationary Orbit, Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space at its 40th Session in Vienna from April 2-13, 2001. in DIGEST OF THE UNITED STATES PRACTICE IN INTERNATIONAL LAW, ch. 12, sub. ch. 85 (2001), *available at* http://www.state.gov/s/l/22718.htm (last visited July 17, 2005).

[40] For more on the United States' space policy, *see* Nina Tannenwald, *Law Versus Power on the High Frontier: The Case for a Rule-Based Regime for Outer Space*, 29 YALE J. INT'L L. 363 (2004).

[41] Christol, *supra* note 24, at 81.

which is based on sovereign control of airspace. The functionalist approach is more favored and may likely prevail, but really does not seem to resolve the boundary problem.

B. A Different Approach

In one of his articles from over ten years ago, Professor Christol proposed a new approach that could address the boundary problem in a more practical way:

> In order to obtain an applicable legal regime for hybrid vehicles [aerospace plane] attention should be focused on (1) the intended purposes, or (2) the effects of hybrid vehicular activity. Further, reference can be made to both purposes and effects. When the capabilities of the aerospace plane are taken into account separate subjective and objective approaches should also be posited. This suggests that if the vehicle's purpose or effect is that of an aircraft it should conform to the regime of air law. If its purpose or effect is that of a spacecraft it would fall within the regime of international space law. This approach, therefore, focuses on the identified purpose or effect of the vehicle. [42]

This proposal, which will be called the "effective approach", seems the most practical because it maintains the current regimes of air and space law like the spatial approach, but without establishing an international defining line between airspace and outer space like the functionalist approach. Prof. Christol does not determine under which regime (air or space law) the aerospace vehicle would fall.

If the two types of RLVs previously discussed follow Prof. Christol's approach, this proposal appears opportune. The suborbital RLV will more likely be used for space tourism, and for high-speed transportation of people and cargo between two points on Earth. This means that under Prof. Christol's approach, this vehicle would have to be operated under the current air law regime because it will operate more like an aircraft. Although the suborbital RLV will use parts of outer space to reach

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[42] *Id.* at 87.

its destination, its effect, or purpose, is that of a high-speed, high-altitude aircraft. On the other hand, orbital RLVs, like Virgin Galactic's proposed orbital spacecraft, or NASA's proposed Crew Exploration Vehicle would fall under the regime of space law because its effect or purpose is that of a spacecraft.[43] Specifically, their main purpose would be to transport astronauts and cargo to orbital destinations, and even to the Moon, or to carry space tourists to orbit.

Prof. Christol also maintains that under his approach there is a need to establish a legal regime for aerospace planes. The proposed regime would "have as its central characteristic an allocative function" to determine if the vehicle will be governed by air law or space law.[44] Conversely, while maintaining Prof. Christol's approach, it also is possible to incorporate aerospace planes and other suborbital RLVs into the existing air law regime instead of creating a new legal regime.

C. Establishing a New International Regime for Reusable Launch Vehicles

The following discussion is based on Prof. Christol's "effective approach" to the boundary problem. Under this approach, a new regime for RLVs would only have to be adopted for orbital RLVs using the international space law regime. Based on this, various authors suggest the creation of an international specialized workgroup in which to discuss the future of space vehicles. Some of the ideas also call for the private and scientific sector to be involved in the process by creating an independent International Spaceways Forum.[45] The Forum will be "coordinated with

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[43] Virgin Galactic is a company established by Richard Branson's Virgin Group. The aims of the company include owning and operating privately built spaceships, modeled on the *SpaceShipOne* craft, designed by Burt Rutan of Scaled Composites. More on Virgin Galactic available at http://www.virgingalactic.com/en (last visited July 18, 2005). More on NASA's Crew Exploration Vehicle available at http://www.nasa.gov/centers/marshall/spacetransportation/index.html (last visited July 19, 2005) *See infra* Section III, for more on the *SpaceShipOne* Rocket by Scaled Composites.

[44] Christol, *supra* note 24, at 88.

[45] William A. Gaubatz et al., *International Rule Planning for Governing Space Transportation*, *in* 43 COLLOQUIUM ON THE LAW OF OUTER SPACE 220, 227 (2000).

the IAA [International Academy of Astronautics] Committee on Space Policies, Economics and the Law, with invitations to participate extended to appropriate government agencies and industry organizations in all interested countries, as well as national and international organizations."[46] There are two suggested frameworks that indeed would be the best.

The first one, suggested by Dr. Claire Jolly, would be "inspired by similar existing co-operation structures in the aviation community, could identify the main safety and liability issues that could arise when operating RLVs from different parts of the world. It might be created under the aegis of ICAO to facilitate interactions between the aviation and aerospace communities."[47] This view suggests the new regime should be formed. The following reasons are provided:[48]

> In a very practical manner, ICAO already provides a forum of discussion and a source of globally agreed regulations for the aviation community...extending this forum to the space launch sector could be practical in the short term. Indeed, cooperating with its members States and the International Air Transport Association (IATA), a non-governmental organization representing aviation companies, the ICAO deals already with key issues such as:
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> -The aviation security
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> -The establishment of air corridors and new air routes
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> -The promulgation of common air traffic services (ATS) throughout regional airspace
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> -The normalization of the management of regional air traffic
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> -The protection of the environment, which constitutes a sensitive subject for aviation and space activities alike, where the focus remains on noise and particle emissions.

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[46] *Id.* at 220.

[47] Claire Jolly, *Reusable Launch Vehicles Regulations: First Step Towards and International Framework*, *in* 43 COLLOQUIUM ON THE LAW OF OUTER SPACE 237, 243 (2000).

[48] *Id.* at 242.

All those issues could be related to future RLV operations.[49]

This approach, which calls for all RLVs to be incorporated into the air law regime, fits very well with Dr. Christol's "effective approach." However, Dr. Jolly's approach does not make the distinction between the orbital and suborbital craft. This distinction is very important because it indicates the appropriate legal regime for a vehicle. Based on this lack of distinction and the "effective approach," it appears that Dr. Jolly's approach would indeed be ideal, for suborbital vehicles but not for all reusable launch or orbital vehicles.

Dr. Nandasiri Jasentuliyana, former director of the United Nations Office for Outer Space Affairs (UNOOSA), suggests that it is up to UNCOPUOS and its Legal Subcommittee (LSC) and Scientific and Technical Subcommittee (STS) to conduct the initial research into the adoption of what he calls "Space Standards". These standards would be similar to the Annexes of the Chicago Convention.[50] The Chicago Convention establishes that each contracting State shall collaborate, to the highest practicable degree, in creating uniformity of regulations and standards that will facilitate and improve air navigation.[51] The Convention also establishes ICAO, which shall adopt and amend, as necessary, the international standards, recommended practices, and procedures in order to create this uniformity.[52] To this end, the Chicago Convention establishes, as one of the mandatory functions of the Council of ICAO, the task of adopting SARPs, designating them as Annexes to the Chicago Convention, and notifying all contracting States of the action taken.[53]

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[49] *Id.* at 242.

[50] NANDASIRI JASENTULIYANA, INTERNATIONAL SPACE LAW AND THE UNITED NATIONS 381 (The Hague: Kluwer Law International, 1999).

[51] Article 37 of the 1944 Chicago Convention states in part "Each contracting State undertakes to collaborate in securing the highest practicable degree of uniformity in regulations, standards, procedures, and organization in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation." Chicago Convention, *supra* note 13, at art. 37.

[52] *Id.* at arts. 43 - 55.

[53] Article 54(l) states: "Adopt, in accordance with the provisions of Chapter VI of this Convention, international standards and recommended practices; for convenience, designate them as Annexes to this Convention; and notify all contracting States of the action taken." *Id.* at art. 54(l).

Dr. Jasentuliyana calls for something very similar to the described approach, although the described functions are of quasi-legislative nature.[54] Article 37 provides that the member States need only to comply with them to "the highest practicable degree", which means that the adopted standards are not self-executing and each State reserves the right to implement them or not, as it chooses.[55] In practice, States generally do comply with the standards. This compliance occurs because airlines of States that do not comply may be denied the right to fly into the airports of complying States due to safety concerns. States must comply with the standards of the Annexes if they want to "have any meaningful participation in international air navigation and air transport."[56]

On the other hand, the Chicago Convention provides for departures from the adopted international standards and procedures, and stipulates that States that cannot comply with them must notify ICAO of the differences between their national legislation and that of the standards.[57] States could apply the same principle to Dr. Jasentuliyana's space standards. This is known as the contracting out procedure, which allows States to avoid certain obligations under the standards. If a State does not notify ICAO of a difference, the State will be bound by the standard and it is understood that the State will implement the standard.[58] In 1993, ICAO indicated that only 25% of the member States have filed a difference to the Annexes, which sets a great example to follow in space law.[59] Unfortunately, this does

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[54] Jasentuliyana, *supra* note 50.

[55] Michael Milde, *Enforcement of Aviation Safety Standards- Problems of Safety Oversight*, 45 ZEITSCHRIFT FÜR LUFT UND WELTRAUMRECHT 3, 5 (1996).

[56] *Id.* at 6.

[57] Article 38 of the Chicago Convention states in part: "Any State which finds it impracticable to comply in all respects with any such international standard or procedure, or to bring its own regulations or practices into full accord with any international standard or procedure after amendment of the latter, or which deems it necessary to adopt regulations or practices differing in any particular respect from those established by an international standard, shall give immediate notification to the International Civil Aviation Organization of the differences between its own practice and that established by the international standard." Chicago Convention, *supra* note 13, at art. 38.

[58] Milde, *supra* note 55, at 6.

[59] Michael Milde, *The Chicago Convention- Are Major Amendments Necessary or Desirable 50 Years Later?*, XIX-I ANNALS AIR & SPACE. L. 401, 426 (1994).

not mean that most of the States are following the standards. Some States do not file differences simply because they lack the personnel to understand what is required by the standards, while others simply do not have the resources or technical means to implement them. For these reasons, the lack of filing of differences must be handled with concern because it may put the safety of aviation at risk on a global scale.[60] In regards to space standards, this filing issue could represent an even bigger problem, because the technology for space transportation is very expensive and unaffordable for most countries. As an alternative, the future space organization could implement something similar to the ICAO Safety Oversight Program. Under this program, States are inspected and audited for compliance and given time to comply.[61] If they do not comply, ICAO publishes the results of the audits. Additionally, an office similar to ICAO's Technical Co-operation Bureau could be created in order to help States implement the space standards.

Following ICAO's model for space transportation is very practical. The standards are considered "soft law," not bound by the Vienna Convention on the Law of the Treaties adopted in Vienna in 1968,[62] and States can deviate from them. In practice, however, States comply with the standards. Non-compliance would mean the elimination of that State from any important participation in commercial aviation and air navigation in general. An example of this is Article 33 of the Chicago Convention establishing the duty of recognition of certificates and licenses of other member-States if they comply with the standards.[63] If one State does not comply with the standards, other States will not allow the non-complying States' personnel or aircraft into their territories. In this sense, one could argue that, in fact, the standards are "hard law" because if the State does not comply, it is excluded from international aviation. States could, and

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[60] *Id.*

[61] Milde, *supra* note 55, at 12.

[62] Vienna Convention on the Law of Treaties, *opened for signature* May 23, 1969, 1153 U.N.T.S. 331, 8 I.L.M. 679.

[63] Milde, *supra* note 55, at 6. *See also* Jacques Ducrest, *Legislative and Quasi-Legislative Functions of ICAO: Towards Improved Efficiency*, XX-I ANNALS AIR & SPACE. L. 343, 354 (1995).

should, adopt these same principles for space vehicles. As time has shown, these principles are an effective tool for establishing worldwide standards that have advanced air transportation significantly.

After the creation of the space standards, Dr. Jasentuliyana suggests that the LSC of UNCOPUOS should draft a convention creating an international framework, not just for RLVs, but also for space vehicles in general.[64] All of this would be done under the direction of an expert group created within the scope of the convention, in which private persons and organizations could be invited to participate by the members of UNCOPUOS.[65]

This framework would be the best alternative because it makes use of the existing infrastructure of international space law. Not only that, by using the United Nations structure and following previous successful models like ICAO, the framework would follow very well known and tested procedures of international law making. In addition, the framework takes into account an additional important factor, the creation of standards for space law, which in air law have been essential. As Dr. Jasentuliyana observes:

> ...the Chicago Convention is one of the most successful international multilateral treaties in existence. However, its Annexes are the primary reason for this. ICAO's success in lawmaking is due to its success in separating the technical and political aspects of international civil aviation. This is exactly what is required in the field of outer space: the political and legal aspects of space sciences and technology need to be made distinct from the technical aspects.[66]

Dr. Jasentuliyana's approach would be more suitable for orbital RLVs because these vehicles would be considered spacecraft under Dr. Christol's effective approach. UNCOPUOS and its subcommittees, along with the UNOOSA, are the ideal forums for formulating this type of regime because they have the expertise and experience in space law. Furthermore, Dr. Jasen-

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[64] Jasentuliyana, *supra* note 50.
[65] *Id.* at 382.
[66] *Id.* at 379.

tuliyana's approach will integrate satellites, expendable launch vehicles (ELVs), and space stations as well as orbital RLVs. Under the effective approach, all of these would fall into the category of spacecraft and thus under the space law regime.

Adoption of both approaches for establishing a new legal regime to include RLVs provides the best result. Ms. Jolly's approach would be suitable for suborbital RLVs while Dr. Jasentuliyana's rule-making approach would be ideal for orbital RLVs. These proposals would be in harmony with Dr. Christol's effective approach and would provide an excellent starting point towards the creation of an international law regime for space vehicles, and for the incorporation of aerospace planes into the air law regime. The result would be that States could adopt an international regime for orbital RLVs along with space standards. On the other hand, suborbital RLVs would fall into the regime of air law and States would have to amend the Chicago Convention and its Annexes to incorporate them.

D. The International Air Law Regime, Aerospace Planes and other RLVs

In an address commemorating the 50th anniversary of the Société Internationale de Télécommunications Aéronautiques (SITA), Dr. Assad Kotaite, president of the ICAO Council, stated that ICAO "was the logical international institution to lead the way into space, and should work with its member States and other international organizations to provide the guidance on space management."[67] This statement, made in 1999, reflects the importance of ICAO in participating actively and directly in the future of space regulation. Other observers agree with Dr. Kotaite's statement. For example, Dr. Ruwantissa I.R. Abeyratne, in one of his most recent books, states:

> ...there is absolutely no difficulty from a commercial standpoint in applying exclusively principles of air law to the operations of an aerospace plane, which carries passengers and

[67] *Annual Review of Civil Aviation, Partnership Emphasized in Address Commemorating SITA's 50th Anniversary*, 54 ICAO JOURNAL 38 (1999), *available at* http://www.icao.int/icao/en/jr/1999/5406.djvu (last visited July 7, 2005).

goods from one state to another, while traversing outer space in the process.[68]

Following Dr. Kotaite's principle, the relevant articles of the Chicago Convention and its Annexes concerning aerospace planes, how this vehicle might fit within the regime of international air law, and the benefits of doing so will now be examined. This is a broad attempt at analyzing the following provisions, and in no way should be deemed an exhaustive study of all the provisions contained in the Chicago Convention or the Annexes that might affect the incorporation of aerospace planes into the regime of air law. Only the most relevant provisions will be discussed.

1. Definition of Aircraft and Aerospace Plane

The first step in incorporating aerospace planes into the current International Public Air Law regime is to amend the current definition of "aircraft" in the Chicago Convention. Aircraft is defined as "[a]ny machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface."[69] This definition, although very simple and straightforward, could represent a major obstacle in incorporating aerospace planes into the air law regime. The reason for this is that aerospace planes would operate outside the Earth's atmosphere, which means that it does not derive its support only from reactions with the air. Either a whole new concept for aircraft has to be developed or the current definition has to be amended to incorporate the aerospace vehicle. Maybe the answer can be found by looking at how some States define aircraft in their national air law regimes. For example, United States' air codes define "aircraft" as "a device that is used or intended to be used for flight in the

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[68] RUWANTISSA I.R. ABEYRATNE, FRONTIERS OF AEROSPACE LAW 23 (Hants: Ashgate Publishing Limited, 2002).

[69] International Standards Rules of the Air Annex 2 to the Convention on International Civil Aviation, 34th Sess., at 1, ICAOOR (9th ed. 1990) [hereinafter Rules of the Air].

air."[70] The Air Code of the Russian Federation defines it as "a flight apparatus supported in the atmosphere due to the interaction with air, which differs from the interaction with air reflected from the surface of land or water."[71] Other States have similar definitions[72] or have adopted the ICAO definition and are not helpful for incorporating the aerospace vehicle or other suborbital RLVs into the regime of air law. However, the definition in Canadian air regulations is the only one seemingly useful in incorporating the suborbital RLV into the regime of air law. Canada defines "aircraft" as "any machine capable of deriving support in the atmosphere from reactions of the air, and includes a rocket."[73] This definition includes and refers to aircraft and rockets, a combination that could include the suborbital reusable launch vehicle. An example is the suborbital reusable launch vehicle designed by Scaled Composites, the White Knight a jet aircraft and *SpaceShipOne* a manned reusable rocket.[74] Regardless of this definition, however, other definitions are possible.

In the first attempt at creating a definition, Dr. Christol's effective approach would be accepted. In this case, the current definition of aircraft becomes obsolete and is replaced with a definition addressing the purposes or effects of the vehicles, instead of a vehicle's aerodynamic and physical properties. The potential definition could be the following: any machine that takes passengers, cargo, or both from one point on the Earth to another without making an orbit of the Earth. A second alternative would be to amend the current definition, keeping the aerodynamic and physical properties of both current aircraft

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[70] 14 CFR § 1.1(2000).

[71] Air Code of RF 60-FZ of March 19, 1997, as amended, at ch. 5, art. 32 (Russian Air Code, 1997), *available at*, http://www.avia.ru/english/code/chapter5.shtml (last visited July 19, 2005).

[72] Other examples include the Joint Aviation Authorities (JAA) of Europe and the Civil Aviation Safety Authority of Australia (CASA), which adopted in their regulations the same definition for aircraft as ICAO, see Joint Aviation Requirements, JAA Reference No. 07/03-1, at § 1 (Nov. 1, 2004) *available at* http://www.jaa.nl/jars_npas/jars/500969.pdf, *see also* Civil Aviation Act, 1988, § 3(1) (Austl., 4th ed., 2004).

[73] Aeronautics Act, R.S.C., § 3(1) (1985) (Can.).

[74] *See infra* Section III, for more on the *SpaceShipOne* Rocket by Scaled Composites.

and aerospace planes. This definition could be the following: any machine that can derive support inside or outside the atmosphere from the reactions of the air other than the reactions of the air against the Earth's surface or that derives support from the mechanics of space flight.

Either definition would incorporate aerospace planes into the air law regime. However, the first option is preferable since it would avoid bringing into the debate physical and mechanical aspects of a vehicle. Under the Chicago Convention, it does not matter how the vehicle traverses the air, or in this case outer space, but where the vehicle traverses it and how this might affect the sovereignty of States and the general safety of people on the ground and in the air. These are the reasons why ICAO and the Chicago Convention were created and adopted in the first place.[75] Additionally, the benefit of adopting any of these definitions under the Chicago Convention Annexes is that States can easily implement them under an established international structure that already has the acceptance of the vast majority of States, which removes the need to draft a new international convention.

2. Registration Issues of Aerospace Planes and other RLVs

If aerospace planes and other suborbital RLVs are to be treated as aircraft by incorporating them into the air law regime using one of the proposed definitions, then the application of the Convention on Registration of Objects Launched into Outer Space becomes moot.[76] Nevertheless, the Convention will be considered briefly to illustrate that even if these vehicles are not treated as aircraft, the Convention is still inapplicable.

There is strong evidence for the inapplicability of the Convention to suborbital RLVs:

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[75] It is important to remember the first Article of the Chicago Convention: "The contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory." Chicago Convention, *supra* note 13, at art. 1. In practice, States are more worried about their sovereignty and safety when a foreign aircraft approaches their airspace than of the mechanics and physical properties of the vehicle.

[76] Registration of Objects Launched into Outer Space, Nov. 12, 1974, 1976, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

> When a space object is launched *into earth orbit or beyond*, the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain.[77]

This explicitly makes the Registration Convention inapplicable to any type of object not launched into Earth orbit or beyond. Aerospace planes and other suborbital RLVs would be operated in sub-orbit and thus will not have to be registered under the terms of this Convention. This supports the position that aerospace planes and other suborbital RLVs should be operated under the air law regime. In addition, the article demonstrates the intention of the Convention's drafters to include only vehicles and objects capable of orbital flight into the regime of space law.

The Registration Convention is inapplicable to suborbital RLVs. This is not only because these vehicles should be treated like aircraft, but also because the Convention itself excludes this type of vehicle from its scope. In the case of orbital RLVs, the same vehicle would have to be registered for each launch; therefore even where the Convention is applicable, its implementation is impractical. Repeated registration of the same vehicle makes no sense and would require States to either amend the Convention or adopt a new one that is not so burdensome for RLVs, but most importantly would be the creation of space standards as mentioned before in Dr. Jasentuliyana's suggestions.[78]

3. Certification and Airworthiness of Aerospace Planes

Annex 8 of the Chicago Convention includes the SARPs for the Airworthiness of Aircraft.[79] Under the Annex, the ICAO policy for airworthiness is to ensure, among others, a "minimum ... basis for the recognition by States of Certificates of Airworthiness for the purpose of the flight of aircraft of other States into

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[77] *Id.* at art. II (1) (emphasis added).

[78] *See supra* section II. C., above, for more on this topic.

[79] International Standards and Recommended Practices Annex 8 to the Convention of International Civil Aviation Airworthiness of Aircraft, 34th Sess., ICAOOR (9th ed. 2004).

or over their territories, thereby achieving, among other purposes, protection of other aircraft, third persons and properties."[80] This policy would be applicable to aerospace planes if the definition of aircraft were amended as discussed. For example, the policy refers to aircraft flying into and over their territories, which means flying an aircraft into and over the sovereign airspace of each State. This interpretation would mean that when flying an aircraft over the territory of another State, the vehicle would be flying in outer space just as aerospace planes or RLVs will.

Another example is the definition of "aeroplane" included in Annex 8. It defines "aeroplane" as "[a] power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces that remain fixed under given conditions of flight."[81] Assuming an amendment of the definition of "aircraft" to include aerospace plane operations, this definition would be entirely applicable to an aerospace plane. This does not mean that just by changing the definition of aircraft, Annex 8 would be applicable to aerospace planes. ICAO would still have to amend the technical standards of the Annex to include technical provisions specifically addressing the physical properties and characteristics of the aerospace plane. Nevertheless, these are easily overcome technical limitations that, in legal terms, do not represent any major obstacle for incorporating aerospace planes and other suborbital RLVs into the air law regime.

4. Air Traffic Rights and Aerospace Planes

The five freedoms of the air of air traffic rights, which are really privileges, are found in the International Air Services Transit Agreement of 1944.[82] An additional sixth freedom exists as the privilege to carry passengers and cargo between two

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[80] *Id.* at vii. *See also* United Nations, *The Convention on International Civil Aviation: Annexes 1 to 18,* ICAO Doc. E/P1/8000, 14-16 (1991) [hereinafter *Annexes 1 to 18*].

[81] *Id.* at I-1.

[82] International Air Services Transit Agreement, *supra* note 32.

other States via the home country of an airline.[83] This is a combination of the third and fourth freedoms and, unlike the other five freedoms, is not based on an international agreement. Instead, it is based on a bilateral system for the exchange of traffic rights between and among different States. In his book *Frontiers of Aerospace Law*,[84] Dr. Ruwantissa I.R. Abeyratne discusses issues related to air traffic rights and aerospace planes, and mentions that aerospace planes will "inevitably create hubs whereby regional carriers would converge with passengers destined for carriage in the aerospace plane."[85] In his view, this would mean, "at least at the introductory stages of the aerospace plane, it would operate on a third and fourth freedom basis".[86] Dr. Abeyratne's view is correct. However, it should be noted that that the reasons for the initial use of aerospace planes on a third and fourth freedom basis only are technical reasons. Aerospace planes, which will operate at very high speeds and altitudes, would most likely be used only for intercontinental flights to city-pairs like London-New York or Los Angeles-Tokyo because it would be uneconomical or impractical to stop for fifth freedom traffic.

On the other hand, the open skies regime is revolutionizing air transport. This policy was developed in 1990-91 and is used to refer to the most liberal type of air transportation agreement between two countries, which provides free market competition and minimizes government intervention. Under this regime, States with mutual agreements grant complete commercial freedom (traffic rights) to each other's airlines. Prof. Henri Wassenbergh states, that not all airlines, especially regional ones, would be able to compete in such a regime and that the only way they will survive is through alliances.[87] This notion was recently reaffirmed at the ICAO Air Transport Seminar, where it was stated that the future of airlines in general lies

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[83] H.A. Wassenbergh, *The Freedoms of the Air*, *in* 1 PUB. INT'L AIR L. 287, 286 (Michael Milde & Hodjat Khadjavi eds., Montreal: McGill University 2002).

[84] ABEYRATNE, *supra* note 68.

[85] *Id.* at 25.

[86] *Id.* at 25.

[87] Henri Wassenbergh, *De-Regulation of Competition in International Air Transport*, XXI 2 AIR & SPACE L. 83, 89 (1996).

with alliances.[88] For aerospace planes, this would mean that their survival would be dependent on alliances of national and regional carriers to bring passengers to the hubs from which aerospace planes will operate. Without future global alliances, aerospace planes may end up being more a novelty than a practical tool for air transportation.

5. Navigation in Airspace and the Reusable Launch Vehicle

The Associate Administrator for Commercial Space Transportation (AST) of the United States FAA recently published "Concept of Operations for Commercial Space Transportation in the National Airspace System."[89] It is a concept manual for operations of RLVs, both orbital and suborbital, within the National Airspace System (NAS) of the United States. In it, the AST recommends a model in which "an upper limit of the NAS is specified in order to demarcate the FAA's operational responsibilities."[90] The manual also describes operations above and below the NAS for point-to-point flights at hypersonic speeds, which is referring to the operations of the aerospace plane and indicating the necessity of establishing a limit to the NAS for these types of operations.[91]

The major problem with this manual is that it requires the designation of an upper limit for the national airspace in order

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[88] In an article by Prof. Paul Dempsey published for the seminar prior to the ICAO Worldwide Air Transport Conference it was stated that the benefits of alliances for the airlines are very meaningful and that airlines will most likely try to continue to pursue such alliances under the open skies agreement. Paul Dempsey, *Intercarrier Agreements and Alliances- The Competitive Challenge, in* AVIATION STRATEGIES: CHALLENGES AND OPPORTUNITIES OF LIBERALIZATION 54, 57 (Ann Barco et al eds., Montreal, World Markets Research Centre 2003). The major problem that alliances represent, according to Prof. Dempsey, is the anticompetitive nature of them. This could represent a problem for the future of the aerospace plane because it will depend on alliances for its survival.

[89] OFFICE OF THE ASSOCIATE. ADMINISTRATOR FOR COMMERCIAL SPACE TRANSPORTATION, CONCEPT OF OPERATIONS FOR COMMERCIAL SPACE TRANSPORTATION IN THE NATIONAL AIRSPACE SYSTEM, Version 2.0 (Washington D.C., May 11, 2001) *available at* http://ast.faa.gov/files/pdf/CST_CONOPS_v2.pdf.

[90] *Id.* at 4.

[91] The manual states "The en-route trajectories for hypersonic missions departing from the U.S. may involve 1) ultra-high altitude flight within the NAS, and a transition directly to international airspace, or 2) flight above the NAS and re-entry into international airspace." *Id.* at 20.

to establish air traffic control (ATC) operational responsibilities. This is, in fact, establishing a defining line between airspace and outer space by adopting a spatialist approach.[92] The manual not only adopts a defining line between airspace and outer space, but it is also contrary to the public policy of the United States, which has always been opposed to the spatialist approach for resolving the boundary problem.[93] Instead of adopting an upper limit for the NAS, the manual needs to establish the operational responsibilities of the air traffic controllers according to the effective approach formulated by Dr. Christol.[94] Under this approach, the vehicle would be under air traffic control[95] depending on the purpose of its operations, no matter where it is located. For aerospace planes and other suborbital RLVs, this means they are always going to be under air traffic control just as commercial aircraft are today.[96] For orbital RLVs, they could also be under ATC control until they are ready to enter orbit, at which point ATC control would cease. Upon re-entry they could be under ATC control from the moment they initiate re-entry maneuvers, such as firing thrusters to slow down and re-enter the atmosphere.

Although adopting AST's position of establishing an upper limit to the national airspace for operational considerations sounds very appealing and convenient, especially from a controller's perspective, adopting this model would require applying two international law regimes to one vehicle. Thus, establishing appropriate air traffic control procedures instead of establishing

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[92] *See infra* section II.A.1., for a description of the spatialist approach.

[93] According to Prof. Bing Cheng the principal reason for the United States to oppose the spatialist approach is "the inability of most countries to monitor such an altitude boundary; the lack of adequate examination of the relevant scientific, legal, technical and political factors; the possible inhibiting and even stifling effect of a fixed boundary on future efforts to explore and use outer space." Cheng, *supra* note 18, at 428.

[94] *See infra* section II, for a discussion on Prof. Christol's approach.

[95] According to Annex 2 of the Chicago Convention "air traffic control" means, "[a] service provided for the purpose of: a) preventing collisions: 1) between aircraft, and 2) on the manoeuvring area between aircraft and obstructions, and b) expediting and maintaining an orderly flow of traffic." Rules of the Air, *supra* note 69, at 2.

[96] Today, international commercial traffic is always under air traffic control when located inside the national airspace of a country. When flying over international waters they follow established international navigation routes. *See Annexes 1 to 18*, *supra* note 80, at 8, 24 .

a definite line between air space and outer space is a better decision because it subjects the vehicle's operations to only one legal regime instead of two.

Dr. Christol's effective approach is the best way to deal with the boundary problem, as it keeps all types of vehicles operating within one regime of international law. At the same time, the approach provides for the development of both the air and space law regimes. In addition, the approach effectively permits the incorporation of suborbital RLVs, like aerospace planes, into the regime of international air law. It also provides for the adoption of air law principles into space law for the further development of the regime in respect to orbital RLVs. Finally, the approach permits smooth transitions of vehicles from one regime to another by focusing on the purpose or effect of that vehicle, and does not restrict transitions from one medium to another based on the location or use of the vehicle.

III. RISK MANAGEMENT, LIABILITY AND THE REUSABLE LAUNCH VEHICLE

A. Introduction

The RLV has been compared to aircraft in terms of risk because like aircraft, the RLV can be used many times. Of course, the RLV is different than a typical aircraft because it can go into space. This difference sets the RLV apart from aircraft in terms of risk allocation, simply because going to space is more hazardous than flying within the Earth's atmosphere. In this section, those differences will be addressed as well as the differences between suborbital and orbital RLVs in terms of risk management and liability. The diverse national and international regimes and the possible application of the aviation liability regime to the RLV will also be examined.

B. Risk Management and the Reusable Launch Vehicle

Risk management can be defined as "a process for identifying and addressing loss exposure of all kinds."[97] This definition gives rise to the different types of risk for RLVs, especially orbital ones, when compared to conventional aircraft. They include, but are not limited to, types of fuels, re-entry operations and velocities. For example, the proposed *Kistler K-1*, an orbital RLV, is going to have a take off weight similar to a Boeing 747 with fuels that are highly toxic and explosive, whereas the 747 fuels are not.[98] In addition, the take off speeds for the *K-1* are similar to those of an ELV, reaching orbital speeds, and it would have to withstand re-entry conditions that are high risk.[99] Although there is no data for the performance of RLVs, like that available for aircraft, the risks of reusable launch to those of the ELV can be compared. For example, launch failure probabilities for existing ELVs vary from approximately 3 in 50, to 1 in 483.[100] This is a very high failure rate when compared to commercial aircraft. Commercial aircraft have a takeoff failure probability estimated to be 1 in 2.3 million.[101]

The exposure for orbital RLVs to loss is greater than for aircraft. However, for suborbital RLVs it could be a different story. A suborbital RLV would not have to endure the same re-entry hazards as an orbital RLV. Though some of the proposed vehicles will use highly explosive and toxic fuels, others are not.

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[97] Julian Hermida, Legal Aspects of Space Risk Management: The Allocation of Risks and Assignment of Liability in Commercial Launch Services 7 (2000) (unpublished LL.M. Thesis, Institute of Air and Space Law, McGill University) (on file with McGill University).

[98] *See* ASSOCIATE ADMINISTRATOR. FOR COMMERCIAL SPACE TRANSPORTATION, LIABILITY RISK-SHARING REGIME FOR U.S. COMMERCIAL SPACE TRANSPORTATION: STUDY AND ANALYSIS 7-13 (2002), *available at* http://ast.faa.gov/rep_study/sp_reports.htm (last visited July 9, 2005) [hereinafter LIABILITY RISK-SHARING REGIME]. The *Kistler K-1* is going to use RP-1 (a kerosene-based rocket fuel) which is similar to JP fuel (jet fuel) and like JP is usually not explosive, but when RP-1 is used in combination with liquid oxygen, which the *K-1* will, then it becomes highly explosive and toxic. For more information see Kistler Aerospace Corporation online at http://www.kistleraerospace.com (last visited June 5, 2005).

[99] LIABILITY RISK-SHARING REGIME, *supra* note 98, at 7-15, Table 7-1.

[100] *Id.* at 7-16, Table 7-2.

[101] *See* BOEING, Accident Rate History, *at* http://www.boeing.com/commercial/safety/pf/pf_accident_rate_history_cht.html (last visited June 5, 2005).

For example, on October 4, 2004 Burt Rutan of Scaled Composite launched *SpaceShipOne*, the first piloted, privately built reusable space ship to reach suborbital flight, winning the Ansari X Prize.[102] It operates as a two-stage system. The first stage vehicle, the *White Knight*, is a piloted twin turbojet aircraft used for high-altitude missions. The second stage vehicle is the piloted suborbital vehicle, *SpaceShipOne*. In this configuration, the *White Knight* is a high-altitude airborne launch platform for *SpaceShipOne*. The *White Knight* launches *SpaceShipOne* at 50,000 feet into suborbital flight and *SpaceShipOne* returns to land as a glider at light airplane speeds. The White Knight uses regular jet fuel and *SpaceShipOne* uses a hybrid rocket motor in which neither the fuel nor the oxidants are hazardous.[103] This means that for suborbital RLVs, risk management can be similar to that of commercial aviation. Of course, just as it took the aviation industry many years to establish the safety record it has today, it will take many years for RLVs in general to have a good safety record.

While risk management aspects can vary greatly between commercial aircraft and RLVs, there are similarities in the involved risks especially for suborbital RLVs. This means that in the near future, when suborbital flights become commonplace, the risk management process could be the same for commercial aircraft and suborbital RLVs. For orbital RLVs, the risk management process is going to be similar to that of the current expendable vehicle launch industry. In this industry, risk is "allocated among the participants by a means of a complex system of reciprocal waivers of liability, indemnification granted by states, commitments to obtain insurance, limitations of liability...and exclusions of liability clauses, among other legal instruments."[104] Although in the future, the operations of orbital RLVs may become so routine, like the operations of the aviation industry,

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[102] For information on Scaled Composites and the Ansari X Prize, *see* http://www.scaled.com, and http://www.xprize.org/ (last visited June 5, 2005).

[103] *See* Scaled Composites, Oxidizer Tank and CTN, *at* http://www.scaled.com/projects/tierone/data_sheets/html/ox_tank.htm (last visited June 5, 2005).

[104] Hermida, *supra* note 97, at 9.

that these vehicles will be able to adopt a similar risk sharing regime.

C. *Definition of Liability*

Liability can be defined as "a legal obligation to compensate for damage caused by action or inaction, intentional or negligent, or simply caused by an act without intention or negligence."[105] There are various types of liabilities and each of them affects the use of RLVs in general.

The first type of liability is strict liability. This type of liability has its origins in the English common law system and has been adopted in various forms by other common law systems.[106] In strict liability, there is no need to prove fault, as fault is presumed, and the victim only needs to prove a relation or causation between the damage suffered and the action or inaction of the defendant.[107] The second type of liability is fault-based liability in which negligence or fault must be proved. This type of liability requires the claimant to prove that the defendant owed him a duty of care, that the defendant breached that duty of care, and that there is causation between the breach and the damage caused.[108]

The third type of liability is absolute liability in which the defendant is liable without the need to prove any fault. The ma-

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[105] Idorenyin Edet Amana, The Montreal Convention of 1999: Problems and Prospects 15 (2002) (unpublished LL.M. Thesis, Institute of Air and Space Law, McGill University) (on file with McGill University).

[106] The case that established strict liability as a doctrine was *Rylands v. Fletcher* whereby a mill owner ordered construction of a dam to get waterpower. Rylands v. Fletcher, L.R. 3 H.L. 330 (1868). The resulting reservoir lay over ancient abandoned coalmines. The mill owner had no reason to suspect that these old diggings led into an operating colliery, but they did. When the dam was closed, water ran down the old shafts, seeping into and flooding the colliery. The mill owner obtained the water for his own use without drainage facilities. The mill owner's use was classified as a "non-natural user" and was found liable.

[107] For example, in *Greenman v. Yuba Power Prods.*, the court established strict liability for product manufacturers in the United States when it stated: "A manufacturer is strictly liable in tort when an article he places on the market, knowing that it is to be used without inspection for defects, proves to have a defect that causes injury to a human being." Greenman v. Yuba Power Prods., 377 P.2d 897, 900 (Cal. 1963).

[108] 1 LEE S. KREINDLER, AVIATION ACCIDENT LAW 103 (Albany: Mathew Bender, 1998).

jor difference between this type of liability and strict liability is that the defendant cannot raise any defenses and the liability is usually imposed in ultra hazardous activities (e.g. nuclear reactors).[109] All three types of liability currently used allocate responsibility in different national and international liability regimes, and as will be explained, will or may apply to RLVs operations.

D. International Liability Regimes

The Outer Space Treaty imposes international responsibility on member States for the activities of their private entities engaged in space activities.[110] The Liability Convention is based upon Article VII of the Outer Space Treaty, and states that this responsibility shall be upon the launching State.[111] This responsibility shall result in absolute liability if damage is caused on the surface of the Earth or to aircraft in flight, and fault-based liability if damage is caused in space.[112] Absolute joint and several liability applies when the space object of one State causes damage to another State's space object that subsequently causes damage to a third State on the surface of the Earth or to its aircraft in flight.[113] Fault based joint and several liability also applies when the damage is caused to a third State's space ob-

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[109] In *Caveney v. Raven Arms Co.*, the federal district court stated that for the imposition of absolute liability, the activity for which the liability is imposed must be an ultra hazardous one. Caveney v. Raven Arms Co., 665 F. Supp. 530 (S.D. Ohio 1987). The court then proceeded to define them as "those activities that pose a danger to persons in close proximity to the activity such as blasting, storing water and storage of explosives." *Id.* at 531. Ultra hazardous activities have also been defined as "those with a risk of serious harm, which cannot be eliminated by exercise of the utmost care." LIABILITY RISK-SHARING REGIME, *supra* note 98, at 5-3.

[110] Outer Space Treaty, *supra* note 12, at art. VI. Article VI of the Outer Space Treaty states, "[p]arties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities". *Id.*

[111] Liability Convention, *supra* note 4, at art. I(c). The "launching State" is defined as "a State which launches or procures the launching of a space object", or "a State from whose territory or facility a space object is launched". *Id.*

[112] *Id.* at arts. II-III.

[113] *Id.* at art IV.

ject.[114] Finally, joint and several liability also applies when two or more States jointly launch a space object.[115]

Absolute and fault-based liability, are imposed for the damage caused by a launching State's space object.[116] The problem with application of these concepts is that the Liability Convention does not define "space object", therefore, it is unclear as to what type of vehicle or object it refers to. However, the Liability Convention does include the term "launch vehicle" as part of the term "space object", but not as a space object itself.[117] The Liability Convention states, "[t]he term 'space object' includes component parts of a space object as well as *its* launch vehicle and parts thereof."[118] From this, it appears that the drafters of the Liability Convention did not want to apply its provisions to the launch vehicle itself, but only if it was part of a space object. In other words, the Liability Convention is inapplicable to a launch vehicle itself, but it is applicable to a launch vehicle that is carrying, or is part of, a space object, whatever that is.

For current ELVs, this does not seem to be a major issue because we can easily argue that the purpose of these vehicles is to carry a space object like a communications or remote sensing satellite. In fact, very few would argue that the term "space object" as stated in the Liability Convention does not include all types of satellites launched into or beyond orbit, as well as space debris.[119] However, for RLVs, this represents an interesting dilemma: if the RLV is not to be used to carry any satellite or ob-

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[114] *Id.* at art. IV(1)(a)-(b).

[115] *Id.* at art. V(1). Nevertheless, States can also have agreements in which one of the launching States assumes all responsibility as a launching State. One example is the Baikonur in Kazakhstan where Russia has agreed to assume responsibility as a launching State. For more on this topic, *see* infra section III.E.4.

[116] *Id.* at arts. II – IV.

[117] *Id.* at art I.

[118] *Id.* at art I(d). (Emphasis added.)

[119] However, Prof. Foster and others have argued that the term "space object" "does not apply to damage sustained by permanent installations, or the persons or property occupying them, on the moon or other celestial bodies." *See* W.F. Foster, *The Convention on International Liability for Damage Caused by Space Objects*, 1972 CAN. Y.B. INT'L L.137, 145-146. *See also* Frans G. von der Dunk, *The 1972 Liability Convention, Enhancing Adherence and Effective Application*, *in* 41 COLLOQUIUM ON THE LAW OF OUTER SPACE 366, 368 (Mar, 23, 1998). Prof. von der Dunk argues for the inclusion of space debris as a space object under the Liability Convention. *Id.*

jects that will become space objects, is the Liability Convention applicable? When referring to a suborbital RLV, the answer is negative. However, the answer is positive when referring to orbital RLVs. For example, if RLVs were used to place satellites in orbit, eventually replacing ELVs, the Liability Convention would be applicable. Of course a RLV capable of placing objects in orbit would have to be an orbital one.[120] However, if the RLV is used for transporting passengers, cargo, or both, and travels in outer space without placing anything in orbit, then it could be argued that this vehicle is not a space object, therefore making the Liability Convention inapplicable.[121] An example is the current type of RLVs being designed for space tourism. These vehicles are not going to be carrying any space objects, unless we consider space tourists space objects. Another example is the future aerospace plane, which will transport cargo and passengers from one point on Earth to another using outer space, but without carrying any space objects. This means that for suborbital RLVs the Liability Convention is inapplicable because they are not going to be part of a space object.

E. National Liability Regimes

The responsibility imposed on States-Parties to the Outer Space Treaty and the Liability Convention has required them to promulgate national laws and regulations. In turn, these national laws require private companies involved in the launching of space objects to assume financial responsibility or to acquire insurance to reimburse the State-Party in case of an interna-

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[120] The reusable launch vehicles that companies like Kelly Space & Technology and Kistler Aerospace, among others, are designing are for delivering payloads into orbit and are going to orbital reusable launch vehicles.

[121] Various authors have excluded some types of reusable launch vehicles, like sounding rockets, from the application of the Liability Convention because they are not objects "designed for movement in outer space." *See* W.F. Foster, *supra* note 119. *See also* Thomas Beer, *The Specific Risks Associated with Collisions in Outer Space and the Return to Earth of Space Objects-The Legal Perspective*, XXV AIR & SPACE L. 42, 47 (2000). Still, there are others like Prof. Cheng who argue that "a space object, whatever this may be, is a space object within the meaning of the Convention only when it is in its operational state, i.e. 'from the time of its launching (or attempted launching) or at any stage thereafter until its descent,' including at the one end the 'planned launching' phase and at the other end the 'recovery phase.'" Cheng, *supra* note 18, at 325-26.

tional or national claim for an accident or incident involving a space object. In this subsection, the national provisions relevant to the liability regime of several space faring nations are discussed.

1. Australia

In 1998, the Australian Parliament enacted the Space Activities Act (SAA).[122] The SAA provides a detailed regulatory framework for space activities, including space vehicle launches. Although it contains some similarities also contained in the United States regulatory framework, it also has some major differences, reflecting the interpretations given by the Australian Government to International Space Law.[123]

In terms of risk management, the SAA is very similar to the United States laws and regulations. The applicant must demonstrate financial responsibility or meet certain insurance requirements, which are based on the maximum probable loss (MPL) that may occur from the launch.[124] In addition, as in the United States law, the licensee of the launch is not liable for claims in excess of the insured amount, except in the case of gross negligence.[125] For claims in excess of the insured amount, the Australian Government assumes liability and pays the corresponding compensation.[126] As for specific MPL amounts for ELVs and RLVs, the Australian Government has not yet determined this because no launch company has applied for a license.[127]

In general, Australia is an ideal place to conduct both ELV and RLV launches because of its geographical position, good weather and extensive unpopulated territory that would make the insurance amounts far less than in other States. However, Australia has not been able to sustain its own launch vehicle capabilities that began with the launch of its first satellite in

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[122] Space Activities Act, *supra* note 25.
[123] For the United States insurance regulatory framework, see infra section III.E.5.
[124] Space Activities Act, *supra* note 25, at § 47.
[125] *Id.* at §§ 67-68, 69(3).
[126] *Id.* at § 64(2).
[127] LIABILITY RISK-SHARING REGIME, *supra* note 98, at 4-3.

1967.[128] This means Australia would have to rely completely on attracting foreign launch providers to build its space industry. Although this has not yet materialized, it is a real possibility because of the advantages of launching from Australia. In fact, Kistler Aerospace has shown interest in launching its future RLV from Woomera, Australia's current spaceport.[129] Nevertheless, without their own launch vehicles, Australia might have difficulties in attracting foreign launch vehicle manufacturers and operators because most of them already have access to well established facilities in their own countries.

2. China

China has proven a good contender for commercial launches even though they entered the international trade in launch services less than fifteen years ago.[130] All commercial launches are conducted by the China Great Wall Industry Corporation, a government owned corporation.[131] This company offers the *Long March* rocket family of launchers, all of which are ELVs.

In terms of insurance and liability, the People's Insurance Company of China provides coverage which is actually underwritten in Europe.[132] For liability, the risk sharing report of the United States Associate Administrator for Commercial Space Transportation (AST) summarizes the requirements very well:

> Third-party liability insurance is in effect for a period of two years following launch. The PRC [People's Republic of China] Government will cover any claims above $100 million. The PRC Government, not a jury, would determine the amount of

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[128] "In 1967, Australia became the fourth country to successfully launch its indigenous WRESTAT satellite, designed and constructed in Australia using a U.S. Redstone rocket from the Woomera launch site." *Id.* at 4-2.

[129] *Id.* at 4-3.

[130] China entered the international trade in launch services when the United States agreed to sign a bilateral launch agreement with China permitting United States commercial satellite manufacturers and operators to launch with China. For more on the United States bilateral launch agreements see PETER VAN FENEMA, INTERNATIONAL TRADE IN LAUNCH SERVICES: THE EFFECTS OF U.S. LAWS, POLICIES AND PRACTICES ON ITS DEVELOPMENT 183 (Leiden: International Institute of Air and Space Law, 1999).

[131] For more on the China Great Wall Industry Corporation, *see* http://www.cgwic.com/ (last visited June 6, 2005).

[132] LIABILITY RISK-SHARING REGIME, *supra* note 98, at 4-5.

> any third-party claims, although a third party can theoretically file claims if he or she does not believe the amount of the government-determined settlement is sufficient. If a client is concerned that the $100 million is not adequate, the CGWIC [China Great Wall Industry Corporation] can arrange for an additional $300 million in third-party launch liability insurance paid for by the client. The CGWIC estimated that an additional $300 million in insurance would cost a client approximately $900,000.[133]

China is only developing ELVs that have good launch failure records. Combining the good records with the low launch cost, they offer very good prices in the current launch industry. As for RLVs, China does not seem very interested and is really putting their other space efforts on human space flight using ELVs, not on RLV technology.[134]

3. Europe

In 1975, several European nations cooperated to create the European Space Agency (ESA) in order to integrate resources and maintain competitiveness in the growing launch industry.[135] The result of this cooperation was *Arianespace*, a private company organized under French law.[136] According to the AST, *Arianespace* is the biggest competitor for United States service

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[133] *Id.*

[134] On October 15, 2003, China became the third nation in the world to independently send humans into space, launching taikonaut Col. Yang Liwei into Earth orbit atop its own Long March 2F rocket. *See* Jim Banke, *China Launches Its First Piloted Spaceflight*, (Oct. 15, 2003), *at* http://www.space.com/missionlaunches/shenzhou5_launch_031014.html (last visited June 6, 2005).

[135] ESA is an organization comprised of 15 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and United Kingdom) that is headquartered in Paris, France. For more information see http://www.esa.int (last visited June 6, 2005).

[136] Arianespace is the production, marketing, and operations organization for the Ariane expendable launch vehicle. The Centre National d'Études Spatiales (CNES), the French space agency, owns the Kourou Space Center from which Arianespace launches and provides site maintenance, operations, and technical support along with payload processing. ESA develops the Ariane rockets and owns launch infrastructure, payload processing and Ariane V production facilities, as well as down-range tracking stations. For more see http://www.arianespace.com (last visited June 6, 2005).

launch providers, and in the past has been the leader in worldwide internationally competed launches.[137]

In terms of liability insurance requirements, the United States study on risk sharing liability regimes best summarizes *Arianespace's* policies as a French-based company:

> Arianespace obtains primary third-party launch liability insurance on behalf of its customer in the amount of 400 million French francs, the equivalent of approximately $53 million U.S. at the current exchange rate (Arianespace 2001b). Insurance covers the liability of the liability of the French Government, CNES, ESA, Arianespace, their contractors and subcontractors, in addition to the launch customer and its contractors, arising out of the launch. This indemnification coverage is in effect for a period of three years following the launch. Any third-party claims exceeding this insurance coverage are the responsibility of ESA (ultimately, the European government owners, principally France). Any damage to the launch site or property owned by ESA is the sole responsibility of ESA and is not covered by any launch-specific insurance requirements.[138]

Neither the French government nor any other European government member of ESA has to cover third party losses beyond the specified amount.[139] Clearly, the liability regime in Europe is a far simpler one when compared to the United States. This, in part, may be because *Arianespace* is not evolving with the market and has little interest in developing RLVs that are expected to increase insurance premiums because of re-entry operations. The future re-entry operations are likely the primary reason for the United States' establishment of a minimum 100 million dollars for liability insurance, which is almost double the amount provided by *Arianespace.*

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[137] *See* ASSOCIATE ADMINISTRATOR FOR COMMERCIAL SPACE TRANSPORTATION. FEDERAL AVIATION ADMINISTRATION, COMMERCIAL SPACE TRANSPORTATION: 2003 YEAR IN REVIEW 14 (2003), *available at* http://ast.faa.gov/files/pdf/YIR03.pdf (last visited July 9, 2005). This document also defines an internationally competed launch contract as "one in which the launch opportunity was available in principle to any capable launch service provider." *Id.* at 2.

[138] LIABILITY RISK-SHARING REGIME, *supra* note 98, at 4-2.

[139] *Id.*

4. Russia

In Russia, all space activities are grouped under one all-inclusive law known as the Law of the Russian Federation on Space Activity, Decree No. 5663-1(hereinafter Decree)[140] This law is a complex set of rules that also provides the foundation for a liability regime regarding the launch of space vehicles. The Decree stipulates that government offices, their officials, as well as citizens of the Russian Federation shall be held liable if found guilty of violating it.[141] The Russian government guarantees, "full compensation for direct damage inflicted as a result of accidents while carrying out space activity in accordance with legislation of Russian Federation."[142] The Decree, contrary to United States regulations, does not set a maximum amount for compensation related to a liability claim arising out of an accident. In addition, the responsible organizations or citizens "shall" pay the compensation, not the government.[143] Finally, the law specifies that liability shall be imposed when a Russian Federation space object, which is not defined in the law, causes damage within the territory of the Russian Federation or outside the jurisdiction of any State (except outer space), regardless of who might be at fault.[144]

In regards to insurance, the Decree is the foundation of a complex insurance regime also based on two other laws of the Russian Federation. The Decree requires compulsory insurance when carrying out any space activities, including space launches.[145] This is contrary to the United States and Australian regimes that provide for alternatives of meeting the financial responsibilities of liability requirements, such as demon-

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[140] Law of Russian Federation on Space Activity, Aug. 20, 1993, Decree No. 5663-1 of the Russian House of Soviets, *available at* http://www.oosa.unvienna.org/SpaceLaw/national/russian_federation/decree_5663-1_E.html (last visited July 9, 2005).

[141] *Id.* at art. 29.

[142] *Id.* at art. 30(1).

[143] *Id.* at art. 30(2).

[144] *Id.* at art. 30(3).

[145] *Id.* at art. 25.

strating financial reserves.[146] There are two other laws that affect the insurance requirements of space launches in Russia. The first is the Civil Code of the Russian Federation, which "defines an insurance contract, explains third-party insurance requirements, and addresses the rights of insurance companies to assess risk."[147] The second is the Russian Federation Law on Organizing the Insurance System in Russia, which "establishes the general principles of state oversight of insurance practices and regulates relations between insurance companies and citizens or other organizations."[148]

Although the customer is the one who usually buys third party liability insurance, the Russian Government will pay claims in excess of the insurance if specified in the launch contract. Third party liability insurance in Russia depends largely on the type of vehicle used in the launch and ranges from 80 million to 300 million USD.[149] It is also interesting to note that for the launches made from the Baikonur spaceport, Kazakhstan is not considered a launching state under the provisions of the Outer Space Treaty and the Liability Convention, and Russia accepts all responsibility for such launches.[150] All of these requirements are based on ELV technology, as Russia does not have current plans for reusable orbital or suborbital launch vehicles. Thus, Russia is like *Arianespace* and does not have to deal with re-entry operations.

5. The United States

Currently the United States has the most complex and developed liability risk-sharing regime for ELVs and RLVs of any

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[146] *Id.* at art. 25(1). For Australia, *see supra* section III.E.1, and for the United States, *see infra* section III.E.5.

[147] Civil Code of the Russian Federation, Part Two, GK RF No. 14-F3 (1996), *amended by* GK RF No. 133-F3 (1997) (Russ.). *See* LIABILITY RISK-SHARING REGIME, *supra* note 98, at 4-7.

[148] Russian Federation Law on Organizing the Insurance System in Russia, No. 4015-1 (1992), *amended by* No. 157-F3 (1997), and *by* No. 204-F3 (1999). *See* LIABILITY RISK-SHARING REGIME, *supra* note 98, at 4-7.

[149] *See* LIABILITY RISK-SHARING REGIME, *supra* note 98, at 4-8. For a detailed description of the insurance requirements for third party liability for each of the different types of Russian expendable launch vehicles see *infra*, Table 1.

[150] *See* LIABILITY RISK-SHARING REGIME, *supra* note 98, at 4-8.

country. The regime is comprised of a three-tier system. Under the first tier, license applicants must prove financial capability to compensate for MPL for damages caused to a third party for death, bodily injury, property damage, or loss resulting from an activity carried out under the license. The licensee must also compensate the United Sates Government for damage or loss to Government property resulting from an activity carried out under the license.[151] MPL is defined as "the greatest dollar amount of loss for bodily injury or property damage that is reasonably expected to result from licensed launch activities."[152] The Associate Administrator for AST makes the MPL determination that is the basis for financial responsibility requirements under the license. The MPL has statutory ceilings not to exceed the lesser of $500 million for third party liability, or the maximum available on the world market at reasonable cost and $100 million for United States Government property, or the maximum available on the world market at reasonable cost.[153]

The second tier is catastrophic loss protection that includes claims exceeding liability insurance and financial responsibility requirements, also known as indemnification.[154] Subject to congressional appropriations, the United States Government may pay successful third party liability claims in excess of required MPL based insurance, up to $1.5 billion (as adjusted for post-1988 inflation) above the amount of MPL based insurance.[155] Additionally, the United States Government waives claims for property damage above required property insurance.[156]

The third tier is for claims above MPL based insurance plus indemnification, which by regulation, the financial responsibility of such claims remains with the licensee or legally liable party.[157] In addition, the United States Government, as an exception, will not indemnify a party's willful misconduct, and

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[151] Commercial Space Launch Act, 49 U.S.C. § 70112(a)(1) (2000 & Supp. 2005).
[152] 14 C.F.R. § 440.3(a)(11) (2000).
[153] 49 U.S.C. § 70112 (a)(3).
[154] *Id.* at § 70113 (2000 & Supp. 2005).
[155] *Id.* at § 70113(a)(1)(B).
[156] *Id.* at § 70113(a)(1)(A).
[157] *Id.* at § 70112(b)(2).

may pay claims from the first dollar of loss in the event of an insurance policy exclusion that is determined to be usual.[158]

The applicant can choose to meet the financial responsibility of MPL through one of the following: financial reserves or; escrow account or; liability insurance, which is the most common and preferred method. An example is Sea Launch, an international partnership of companies from the United States, Russia, Ukraine and Norway.[159] Sea Launch launches rockets from international territory, the Pacific Ocean, and was required by the United States Government to obtain insurance and a license from the Department of Transportation for the launch of its vehicles because a United States company, Boeing, was deemed to hold a "controlling interest"[160] as defined under the Commercial Space Launch Act of the United States. Specifically, Boeing Launch Services owns 40 percent of the company, which makes Boeing the majority shareholder with a controlling interest.[161] By requiring Boeing to obtain sufficient insurance, the United States could protect itself in case an international claim was made under the provisions of the Liability Convention.

One final aspect that distinguishes the United States regime from that of other States is the expiration date for the liability regime established under the Commercial Space Launch Act. Under the current extension, the provisions pertaining to claims exceeding the minimum insurance amounts (government indemnification) and financial responsibility requirements will expire on December 31, 2009.[162] For licenses submitted after this date, the United States government will not provide in-

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[158] *Id.* at § 70113(a)(2).

[159] For more on Sea Launch, see http://www.sea-launch.com/ (last visited June 7, 2005).

[160] Under United States regulations "controlling interest" means "ownership of an amount of equity in such entity sufficient to direct management of the entity or to void transactions entered into by management. Ownership of at least fifty-one percent of the equity in an entity by persons described in paragraph (1) or (2) of this definition creates a rebuttable presumption that such interest is controlling." 14 C.F.R. § 401.5 (2000).

[161] The other companies in Sea Launch are S. P. Korolev Rocket and Space Corporation Energia of Russia (25 percent), Kvaerner of Norway (20 percent), and SDO Yuzhnoye/PO Yuzhmash of Ukraine (15 percent). Sea Launch, Organization, *at* http://www.sea-launch.com/organization.htm (last visited June 7, 2005).

[162] 49 U.S.C. § 70113(f) (2001 & Supp. 2004).

demnification for claims above the insurance coverage amounts. Congress has been extending this sunset provision, expiration date, since 1988 through amendments to the Act. It is probably the biggest factor affecting United States competitiveness in the launch industry right now, and will most likely be amended before the next expiration date.

6. Other Countries

Other countries that currently have space launch capabilities and that also have some kind of liability regime for space launches include: Brazil, India, Israel, Japan, South Africa, Sweden, Ukraine and the United Kingdom.[163] For the regimes of these States and the regimes of States previously discussed, the following table provides a comparison of each of them.[164]

Table 1 Comparison of National Liability Regimes

Country	Commercial Space Launch Capability ELV Name(s) (launcher affiliation)	Insurance Requirements for Third Party Liability	Number of Tiers of Licensee Government Third Party Risk Sharing	Launch Licensee's Required Amount of Third Party Liability Insurance	Government Supplied Third Party Liability Indemnification
Australia	No, but foreign interest (foreign commercial)	Yes	2	MPL, similar to U.S. method	No Limit
Brazil	Under development VLS (government)	Draft	2 (Proposed)	Not Specified (but launch risk-based)	Unknown
China	Yes, Long March (government)	Yes	2	$100 million (client can request another $300 million)	No Limit

[163] For detailed information on the liability regime of these countries, see *Annexes 1 to 18*, *supra* note 80, at ch. 4.

[164] All data from the table was adopted from Table 4-4 of the AST report on risk sharing liability, LIABILITY RISK-SHARING REGIME, *supra* note 98, at 4-13.

Europe (ESA)	Yes, Ariane (government)	Yes	2	$53 million at current exchange rate (400 million French francs)	No Limit
India	Yes, GSLV (government)	Yes	2	Not Specified	No Limit
Israel	Under Development Shavit (commercial)	No	N/A	Not Specified	None
Japan	Yes, H-IIA (government)	Yes	2	$50 million or $200 million (depending on launch vehicle)	No Limit
Russia	Yes, Cosmos, Dnepr, Rockot, START, Soyuz, Zenit, Proton, Molniya, Tsyklon, Strela (government)	Yes	2	$80 million to $500 million(depending on launch vehicle)	No Limit – By contract only
South Africa	No	Yes	1	Not Specified	None
Sweden	No	Yes	2	Not Specified	None
Ukraine	No, but affiliated with foreign ventures – Zenit (commercial)	Yes	N/A	Not Specified	Not Specified
United Kingdom	No	Yes	1	$142 million	None
United States	Yes, Atlas, Delta, Minotaur, Taurus, Pegasus (commercial) Athena	Yes	3	MPL (but not more than $500 million). Current licensed ELVs have MPLs of from $0.25 million to $261 million (Delta IV)	$1.5 billion above the MPL (as adjusted post-1988 inflation)

ESA = European Space Agency; MPL = maximum probable loss; ELV = expendable launch vehicle; GSLV= Geostationary Launch Vehicle; VLS = Vehiculo Lancador de Satelites; N/A=Not available. All amounts in USD, unless specified.

Table 1 illustrates that the United States is the only State with a three-tier system for third party liability, making it the most complex system. Additionally, the United States is the only State with an expiration date and a cap for government indemnification, which affects the United States' competitiveness. On the other hand, Australia and the United States are the only States in which the required amount of insurance is based on MPL. This is advantageous because it provides a flexible way of determining the insurance amounts based on the type of operations conducted under the license. This flexibility is an excellent way to incorporate RLVs into the current risk-sharing regime. Finally, under some of the liability regimes, notably the United States and Australia, steps have been taken to incorporate the RLV into the current ELV regime. Although this seems like a logical step, it only impacts orbital RLVs. They will have operations similar to ELVs, with the difference that they can re-enter the Earth's atmosphere to be used again. Since suborbital RLVs operate differently, they will be examined in the next section as to the viability of incorporating them into the current aviation liability risk regime.

F. International Air Carrier Liability and the Reusable Launch Vehicle

The Montreal Convention[165] will be in force when RLVs begin operation.[166] Under the Montreal Convention, the liable

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[165] Montreal Convention, *supra* note 7.

[166] "Warsaw system" refers to the Convention for the Unification of Certain Rules Relating to International Carriage by Air and all its protocols, additional protocols and agreements. Convention for the Unification of Certain Rules Relating to International Transportation by Air, opened for signature Oct. 12, 1929, 49 Stat. 3000, 137 L.N.T.S. 11, This system was replaced by the Convention for the Unification of Certain Rules Relating to International Carriage by Air, 28 May 1999, (1999 Montreal Convention), which incorporates all of the protocols, additional protocols and agreements of the Warsaw System. Montreal Convention, *supra* note 7. The Montreal Convention entered into force on November 4, 2003 and as of July 10, 2005, there were 65 parties to the Convention. For list of parties to the convention, see http://www.icao.int/icao/en/leb/mtl99.htm (last visited July 10, 2005). For more on the new Montreal Convention see Amana, *supra* note 105.

party is the operating carrier because liability arises from a contract in which the carrier has the obligation to transport passengers in a safe manner.[167] The State where such airline is registered is never held liable. This principle contrasts sharply with the one contained in the Liability Convention regarding space objects, where liability is placed upon the launching State of the space object and no contractual relationship is required.[168] Additionally, the type of liability under the Montreal Convention is strict liability, whereas under the Liability Convention it is a mix of absolute and fault liability.[169] Finally, the Montreal Convention is applicable to international carriage by air, whereas the Liability Convention applies only to the launching of space objects.[170]

The two drastically different regimes raise two questions. First, which applies to RLVs? Second, can the principles of the aviation liability regime be applied to them? There cannot be a definitive answer because there are insufficient experience, statistics and data regarding suborbital RLV performance. However, some theories can be posited. Following the theory that the Liability Convention would only be applicable to orbital

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[167] Article 17 of the Montreal Convention stipulates, "[t]he carrier is liable for damage sustained in case of death or bodily injury of a passenger upon condition only that the accident which caused the death or injury took place on board the aircraft or in the course of any of the operations of embarking or disembarking." Montreal Convention, *supra* note 7, at art. 17. Thus, the liability is imposed upon the carrier and not the State. It is interesting to note that the term "bodily injury" is defined in the United State's regulations as, "physical injury, sickness, disease, disability, shock, mental anguish, or mental injury sustained by any person, including death." 14 C.F.R. § 440.3(a)(1) (2000), In the definition, mental anguish is included as being a form of bodily injury, an interpretation that caused much litigation under the Warsaw system, because the term bodily injury was never defined, not even in the new Montreal Convention of 1999. Maybe, in the future, International Public Air Law attorneys can borrow from these regulations, at least as a parallel or example in the United States, in order to support their views or influence a judicial decision.

[168] Liability Convention, *supra* note 4, at arts. II – V.

[169] The Liability Convention Articles II and III clearly establish both types of liability. *Id.* at arts. II – III. The strict liability in the Montreal Convention arises from the contract of carriage where the general rule is duty of care. See *supra* section III.C, for more on the types of liability.

[170] *See* Liability Convention, *supra* note 4, at arts. II - III. *See also* Montreal Convention, *supra* note 7, at art. 1.

RLVs but not suborbital ones,[171] the only choice is to incorporate suborbital RLVs into the air law regime or establish a new regime. For international liability purposes only the applicable possibilities for suborbital RLVs will be discussed, as orbital vehicles would have to be included under the provisions of the Liability Convention.

The option of incorporating the suborbital RLV into the international regime of air law produces some major obstacles in the Montreal Convention. The Montreal Convention states, "[t]his Convention applies to all international carriage of persons, baggage or cargo performed by *aircraft* for reward."[172] The word "aircraft" seems to exclude the suborbital RLVs. Although not defined in the Montreal Convention (international private air law), it would be easy to argue that the word "aircraft" as used in the Montreal Convention has the same definition as the one used in the Chicago Convention (international public air law). That is, an "aircraft" is "[a]ny machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface."[173] The application of this definition to the international private air law regime would make the Montreal Convention inapplicable to the suborbital RLV. This means that either a definition for the international private air law regime that would include suborbital RLVs has to be adopted, or the second option of establishing a new RLV international liability regime is necessary. It would be more practical to adopt a definition of "aircraft" to include suborbital RLVs.[174] In this sense, suborbital RLVs, like future aerospace planes, would have the same protection in terms of liability that other air carriers would. Furthermore, this action will protect the new suborbital RLV industry while it grows and

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[171] In this theory the term "space object" does not refer to the launch vehicle, unless it is part of it. *See infra* section III.D, for more on this topic.

[172] Montreal Convention, *supra* note 7, at art. 1(1) (emphasis added).

[173] Rules of the Air, *supra* note 69. *See also supra* section II.D.1, for more on the definition of aircraft under the international air law regime.

[174] For the International Public Air Law regime this article suggested various definitions of aircraft that would include suborbital reusable launch vehicles. *See supra* section II.D.1, for the suggestions given.

develops, just as the Warsaw Convention protected the emerging airline industry in the 1930s.

Another reason for incorporation is that there is currently only one suborbital RLV in use, *SpaceShipOne*. As in 1929, when there was little information about the risks of the emerging airline industry, there is insufficient information on the risks associated with suborbital RLVs. Incorporating them into an existing regime would provide further protection for the industry to develop. According to some scholars, the emerging industry could turn out to be a highly profitable business if prices become accessible to most people.[175] Of course, it will be years before suborbital RLV operations become as common and safe as current airline operations, and even longer for the risks of both operations to be comparable.[176] A transition period is needed for these vehicles in which they would be treated under the same standards as ELVs in terms of risk management, and not the standards used for commercial aviation.

The transition period is essential because the safety record of suborbital RLVs can not be expected to be as good as the aircraft industry's record. During the transition period, risks of suborbital RLVs should be associated with risks of ELVs. National laws dealing with launch vehicle liability, such as the Commercial Space Launch Act of the United States,[177] should be applicable. In this transition period, the performance of the expendable launch vehicle industry should be used to calculate risk instead of using the risks associated with the aircraft industry. This is important because it is probable that RLVs will have similar risks to ELVs, at least in the beginning. In addition, the transition would ensure the protection of suborbital RLVs as an industry while it develops. After this transition period, the current international private air law regime might be well suited because of the similarities between these vehicles and commercial aircraft, and because it will continue to protect

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[175] If the prices of tickets comes down to 10,000 USD per person "...space travel by 'ordinary' people or 'average' people could become possible in the near future." Ram Jakhu & Raja Bhattacharya, *Legal Aspects of Space Tourism*, 45 COLLOQUIUM ON THE LAW OF OUTER SPACE 112 (2002).

[176] *See supra* section III.B, for more on the associated risks of airline operations.

[177] Commercial Space Launch Act, *supra* note 151.

the industry. Finally, while national insurance requirements for future suborbital RLVs are adequate for the time being,[178] these vehicles might see a rapid development. It would be wise if we decide in a legal sense early on where we are going to place these vehicles before they start flying across national borders, which inevitably will bring liability claims arising out of incidents and accidents related to the operations of these vehicles.

IV. CONCLUSIONS AND RECOMMENDATIONS

The best method for classifying RLVs is to divide them into two categories: orbital and suborbital. Orbital RLVs would be governed under the space law regime. Suborbital RLVs would be governed by the air law regime, with the addition of some major amendments, and with a transition period during which they would be treated under standards specially designed for them.

The transition period would calm the concerns of suborbital RLV investors who are concerned that the FAA's Office of Regulation and Certification, and not the AST, would obtain jurisdiction over such vehicles. On July 24, 2003, in a Joint Hearing of Congress on Commercial Human Space Flight before the Subcommittee on Space and Aeronautics, Dennis Tito testified, "[a]s far as sub-orbital space flight, we don't know who will regulate us. And it looks like the FAA might be involved in regulating us, at least on the aviation side, and that is very, very scary. The third area that I think is important is that there should be a clear distinction between the Office of Commercial Space Transportation and the aviation side of FAA, because if the aviation side of FAA gets involved, we're going to go on to a bureaucratic deadlock that's going to go beyond my life expectancy,

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[178] In the United States, a recent study on liability risk sharing regimes found the current U.S. liability regime "adequate". According to the AST, "The current liability risk-sharing regime for commercial space transportation is judged to be adequate based on historical acceptability of statutory risk allocation, including risk-based insurance requirements; support of U.S. obligations under relevant treaties; and the ability of the U.S. launch industry to compete for a share of the commercial space launch market." LIABILITY RISK-SHARING REGIME, *supra* note 98, at 10-3.

and, therefore, be very difficult to invest." [179] In the same hearing Elon Musk testified, "We recommend reaffirming the authority to the AST office of the FAA as the primary regulatory agent for space vehicles." [180]

Their concern is that if the FAA Office of Regulation and Certification, which has dominion over the certification of commercial and experimental aircraft, obtains jurisdiction over suborbital RLVs, it will apply the same standards used for aircraft in terms of safety and liability. This "would ensure that commercial space flight never gets off the ground."[181] Suborbital RLVs in the United States should be under AST jurisdiction, even after the initial transition period. AST has the experience and personnel to deal with these vehicles, which in the beginning would be similar in risks and operations to current ELVs. The same should be for other States that have established similar laws and offices for the regulation of space activities.

On the other hand, some members of the emerging space tourism industry, an industry that will initially depend on suborbital RLVs, think these vehicles should never be treated as aircraft. Jeff Greason, president of XCOR Aerospace, has gone a little further and has asked the United States Congress to "shield the fledgling industry from excessively burdensome regulation, establish a formal definition of suborbital rocket that makes clear they are not airplanes, and affirm an individual's right to waive liability before becoming a passenger of one of the planned services."[182] However, it is not necessary to go so far in order to protect the suborbital RLV or space tourism industry while it develops. For example, the airline industry was protected internationally against liability claims. From its be-

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[179] *House Science Subcommittee on Space and Aeronautics and Senate Commerce, Science, and Transportation Subcommittee on Science, Technology, and Space, Joint Hearing on Commercial Human Spaceflight*, 108th Cong. 18 (2003) (statement of Dennis Tito) [hereinafter *Joint Hearing on Commercial Human Spaceflight*]. *See also*, Brian Berger, *Dennis Tito Ready to Invest in Suborbital Rocket, But Wary of Government Regulators*, SPACE NEWS (July 24, 2003), *at* http://www.space.com/missionlaunches/tito_regulations_030724.html (last visited June 6, 2005).

[180] *Joint Hearing on Commercial Human Spaceflight*, *supra* note 179, at 22.

[181] *Id.* at 27.

[182] *Id.*

ginnings through today, it did not have to go as far as waiving complete liability for passenger claims against airlines for accidents in international travel.

Manufacturers and operators of suborbital RLVs should be held liable for damage or injury caused to passengers, but liability should be limited, not waived, as the industry develops. A good precedent is establishing strict liability for the emerging airline industry under the provisions of the Warsaw Convention. Similar provisions could be established for suborbital RLVs used in space tourism. Alternatively, these vehicles can be incorporated into the international air law liability regime, protecting the industries while they grow and develop.

On the boundary issue, the effective approach is the most practical way to resolve this issue. Under this approach, unlike the functionalist or spatialist approaches, both air and space law regimes are maintained without establishing a defining line between airspace and outer space. For suborbital RLVs, the approach means that these vehicles would fall under the regime of air law. These vehicles will be used for space tourism, sounding, and for high-speed transportation of people and cargo between two points on Earth, meaning their effects or purposes are those of a high speed, high altitude aircraft. For orbital RLVs, this approach means they would fall under the regime of space law because their effect or purpose is that of a spacecraft, carrying cargo and people between earth and space.

For registration and certification issues, orbital RLVs should remain within the regime of space law. Space standards similar to the international SARPs contained in the Annexes to the Chicago Convention should be established for these vehicles and all other space vehicles or objects. The Registration Convention should be amended to accommodate orbital RLVs, and a definition of space object should be adopted which would include these vehicles. Suborbital RLVs should be included under the regime of air law. The international framework for these vehicles should be created under the auspices of the ICAO by either amending existing conventions or establishing new ones.

In terms of national liability and risk management of orbital RLVs, the current system of insurance requirements or financial reserves for States involved in space launches should

be maintained. The operations of these vehicles are going to be very similar to the operations of ELVs. The current systems are appropriate. For international liability, the Liability Convention should be amended to include orbital RLVs. In the case of national liability for suborbital RLVs, the current national systems of risk management and liability should also be maintained, but only during the transition period. In the long term, it would be appropriate to incorporate these vehicles into the regime of air law once they become commonplace and operate as safely as conventional aircraft. For international liability of suborbital RLVs, the Montreal Convention should be amended to include these types of operations.

Finally, scientists, engineers, policy makers, and law experts should work together both at ICAO and at UNOOSA to begin establishing rules and parameters defining the different types of RLVs. Differentiating orbital and suborbital RLVs would resolve much of the debate of where to place these vehicles. This distinction is a logical way to determine the applicable regime for each of the different types of RLVs. Nevertheless, one thing is certain; RLVs are going to be part of our near and far future and just like every other activity that in which humankind has been engaged, this one will also need regulation. Ideas and knowledge must be exchanged so one day the dream of one ancient Chinese official can be fulfilled and "boldly go where no one has gone before."[183]

[183] Gene Roddenberry, creator of "Star Trek", coined this famous phrase in his popular science fiction series.

THE EVOLUTIONARY STAGES OF THE LEGAL SUBCOMMITTEE OF THE UNITED NATIONS COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE (COPUOS)

Sergio Marchisio[*]

I. GENERAL

International space law has undergone a deep evolution since it first began in the 1950s. Space activities and globalisation now underline a profoundly changed legal framework. On the one hand, we have seen new paths and inputs; the evolution of space activities in a number of fields emerging from scientific and technological development; an increased number of Nation-States involved in space activities; the commercialisation and privatisation of some space activities; and partnerships between and among Nation-States, international organisations and private entities.[1] On the other hand, we have also seen the consolidation of new sectors, where space activities have an impact: protection of the environment and natural resources management; prevention of natural and human-induced disasters; global communications; and, space industry development in a drive towards growth.[2]

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[1] *See International Organisations and Space Law: Their Role and Contributions*, 3 PROC. ECSL COLLOQUIUM 6-7 (Noordwijk, 1999).

[2] On the beginning of space law, *see* Eilene Galloway, *The History and Development of Space Law: International Law and United States Law*, VII ANNALS OF AIR AND SPACE LAW 295- 317 (1982).

To be sure, the world is vastly different today than it was when the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), was first established. At that time, the complex issues that had to be resolved had the additional complication of the intense Cold War rivalry. It is to be recalled, in fact, that shortly after the launching of the first artificial Earth orbiting satellite, the Soviet *Sputnik I*, the Permanent Representative of the United States to the United Nations wrote to the Secretary-General, requesting that an item, "Programme for International Co-operation in the Field of Outer Space", be placed on the 1958 General Assembly agenda. The letter called for the Assembly to establish an *ad hoc* committee to make the necessary detailed studies and recommendations as to what specific steps the Assembly might take to further humanity's progress in outer space and to assure that outer space [would] be used solely for the benefit of all humankind.

On 13 December 1958 the U.N. General Assembly established the UNCOPUOS, as an *ad hoc* body with eighteen members.[3] One year later, on 12 December 1959, the General Assembly gave it the status of a permanent body and reaffirmed the mandate given to it by U.N. member States.[4] From a juridical point of view, the UNCOPUOS was qualified as a standing subsidiary organ of the General Assembly, in accordance with the Charter of the United Nations (U.N. Charter).[5]

In considering the legal nature of the UNCOPUOS, two elements are indeed to be taken into account. Firstly, the Committee was not established as an independent international organization founded on a treaty, like the specialized agencies of the United Nations, but as an organ of the General Assembly. Sec-

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[3] Question of the Peaceful Use of Outer Space, G.A. Res. 1348, 13th Sess. (1958) [hereinafter G.A. Res. 1348], *available at* http://www.un.org/documents/ga/res/13/ares13.htm (last viewed July 17, 2005).

[4] International Co-operation in the Peaceful Uses of Outer Space, G.A. Res. 1472, 14th Sess. (1959), *available at* http://www.un.org/documents/ga/res/14/ares14.htm (last viewed July 17, 2005).

[5] "Such subsidiary organs as may be found necessary may be established in accordance with the present Charter." Charter of the United Nations, June 26, 1945, art. 7(2), 59 Stat 1031 [hereinafter U.N. Charter]. "The General Assembly may establish such subsidiary organs as it deems necessary for the performance of its functions." *Id.* at art. 22.

ondly, its composition and functions are established by a decision of the plenary organ, which can always modify UNCOPUOS membership and its mandate by an act of the same nature, without amending the United Nations Charter. The idea of creating an international space organisation, based on an *ad hoc* treaty, was not considered at the time UNCOPUOS was established. Although the idea was circulated as a proposal within the U.N., it did not raise support. UNCOPUOS was intended to be more of a political organ devoted to strenghtening international cooperation among spacefaring Nations with their national space programmes, rather than as a technical organization with the competency to realize direct operational activities in space. At present, the creation of a world space organization is still often advocated by academic voices and scientific institutions.[6]

Furthermore, due to its specialized scope of action, UNCOPUOS was originally established as an organ with a restricted membership of eighteen Members.[7] However, the membership has been expanded several times to achieve more balanced participation among U.N. member Nation-States. It now includes sixty-seven States,[8] which constitute approximately one-third of the entire U.N. membership. From the beginning the Committee also allowed, on the basis of unilateral concessions, the participation of observer entities. They include a

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[6] See Simone Courteix, *Towards a World Organization?*, *in* OUTLOOK ON SPACE LAW OVER THE NEXT 30 YEARS ESSAYS PUBLISHED FOR THE 30TH ANNIVERSARY OF THE SPACE TREATY 421-427 (Gabriel Lafferranderie & Daphné Crowther, eds. 1997).

[7] They were: Argentina, Australia, Belgium, Brazil, Canada, Czechoslovakia, France, India, Iran, Italy, Japan, México, Poland, Sweden, the Union of Soviet Socialist Republics, the United Arab Republic, the United Kingdom of Great Britain and Northern Ireland, and the United States of America. G.A. Res. 1348, *supra* note 3.

[8] They are: Albania, Algeria, Argentina, Australia, Austria, Belgium, Benin, Brazil, Bulgaria, Burkina Faso, Cameroon, Canada, Chad, Chile, China, Colombia, Cuba, Czech Republic, Ecuador, Egypt, France, Hungary, Germany, Greece, India, Indonesia, Iran, Iraq, Italy, Japan, Kazakhstan, Kenya, Lebanon, Libyan Arab Jamahiriya, Malaysia, Mexico, Mongolia, Morocco, Netherlands, Nicaragua, Niger, Nigeria, Pakistan, Peru, Philippines, Poland, Portugal, Republic of Korea, Romania, the Russian Federation, Saudi Arabia, Senegal, Sierra Leone, Slovakia, South Africa, Spain, Sudan, Sweden, Syrian Arab Republic, Thailand, Turkey, the United Kingdom of Great Britain and Northern Ireland, the United States of America, Ukraine, Uruguay, Venezuela and Viet Nam, *available at* http://www.oosa.unvienna.org/COPUOS/members.html (last visited June 7 2005).

number of international organizations, both intergovernmental and non-governmental, which are dedicated to the development of international space cooperation.

Looking at the founding resolutions, one might easily understand that the main tasks of the Committee were not legal or institutional. In fact, it was established in order to consider the activities and resources of the United Nations; the specialized agencies and other international bodies relating to the peaceful uses of outer space; international cooperation; and, programs in the field that could appropriately be undertaken under United Nations auspices and within its organizational arrangements to facilitate international space cooperation. From this perspective, UNCOPUOS has been the focal point for all space-related cooperative programmes furthered by the United Nations since the early 1960s.

However, the first General Assembly resolution also opened the way for considering "legal problems which may arise in the carrying out of programmes to explore outer space."[9] Along this line, an important step was taken in 1961. The General Assembly requested the Committee to "maintain close contact with governmental and non-governmental organizations concerned with outer space matters;...to provide for the exchange of such information relating to outer space activities as Governments may supply on a voluntary basis...;...[and] to assist in the study of measures for the promotion of international co-operation in outer space activities."[10] These terms of reference have since provided "general guidance for the activities of the Committee in promoting international cooperation in the peaceful uses and exploration of outer space."[11]

From the legal point of view, it is worthy to note that the Resolution also requested the Secretary-General to maintain a

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[9] G.A. Res. 1348, *supra* note 3, at 1(d).

[10] International Co-operation in the Peaceful Uses of Outer Space, G.A. Res. 1721, 16th Sess., at B(3)(a) - (c) (1961) [hereinafter G.A. Res. 1721], *available at* http://www.oosa.unvienna.org/SpaceLaw/gares/html/gares_16_1721.html (last visited July 17, 2005).

[11] Office for Outer Space Affairs, United Nations Committee on the Peaceful Uses of Outer Space: History and Overview of Activities, *available at* http://www.oosa.unvienna.org/COPUOS/cop_overview.html (last visited June 7, 2005).

public launch registry based on information supplied by States launching objects into orbit or beyond.[12] It called also upon launching States to "furnish information promptly" to the COPUOS, through the Secretary-General, for the registration of launchings.[13] This recommendation, though non-mandatory, has not been superseded by the Registration of Objects Launched into Outer Space[14] and is still followed on a voluntary basis by some States that have not yet ratified the Convention, for example, Algeria, Israel and Italy.[15]

The internal structure of the UNCOPUOS also deserves some attention. Like many other subsidiary organs of the United Nations, it has two Subcommittees. They are the Scientific and Technical Subcommittee (STS) and the Legal Subcommittee (LSC). They were created at the second session of UNCOPUOS in 1962 and each subcommittee is composed of the same member States that comprise the parent body. These internal bodies, which are, legally speaking, the expression of the inherent power of self-organisation of the UNCOPUOS, were created to assist it in the study of the many specific proposals and suggestions concerning, on the one hand, the scientific and technical aspects of space activities, and, on the other hand, the legal matters raised by member States for the development of international cooperation in space exploration for peaceful purposes. The STS held its first session from 28 May to 13 June 1962, and the LSC first convened in Geneva on 28 May 1962. This latter date may be considered as the starting point of the evolutionary stages of the UNCOPUOS. The LSC has since then made a remarkable contribution to the development of international space law. It has succeeded in adopting five treaties, four sets of Principles, and other relevant documents.

Currently, the UNCOPUOS and its two Subcommittees meet annually in Vienna, each for two-week periods. They con-

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[12] G.A. Res. 1721, *supra* note 10, at B(1)-(2).

[13] *Id.*

[14] Registration of Objects Launched into Outer Space, Nov. 12, 1974, 1976, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

[15] *See Practice of States and International Organizations in Registering Space Objects*, A/AC. 105/C.2/L. 255, UNCOPUOS 44th Sess. (April 2005) (background Paper by the Secretariat).

sider questions put before them by the General Assembly, reports submitted to them, and issues raised by the member States. The UNCOPUOS and the Subcommittees, adopt, without voting - that is, by *consensus* - conclusions and reports and, if it is the case, other draft documents, including treaties, declarations of principles and resolutions containing recommendations, to be finally approved by the General Assembly. The General Assembly is the principal organ of the United Nations and has the competence for dealing with space and related matters. It debates the outcome of the UNCOPUOS's deliberations and adopts annually, at its ordinary session, a specific resolution on international cooperation in the peaceful uses of outer space (that is to say, an *omnibus* resolution), giving general guidance for the work the UNCOPUOS, and any other decision that may be suitable according to the nature of the drafts submitted by it.

II. THE THREE EVOLUTIONARY STAGES OF THE COPUOS LEGAL SUBCOMMITTEE: THE LAW-MAKING PHASE

The major role of the UNCOPUOS and its Subcommittees is the development and strengthening of international cooperation in the field of space exploration and exploitation has been underlined. This role might be accomplished by different kind of activities, which essentially include study and documentation, on the one hand, and, on the other hand, recommendatory action for member States to take in order to direct their behaviours. This second category covers the assessment of legal problems that arise as a result of the exploration of outer space, the development of international cooperation in the legal field and the promotion of international space law. By examining the LSC accomplishments in the field of international space law, it is easy to identify three evolutionary phases.

The first phase I will call the *law-making era* of the LSC. It began just after LSC's creation and ended in the 1980s. The second phase is the *soft-law* phase, and was signed by the adoption of five sets of principles and ended in the middle half of the 1990s. The third, and current, phase is characterized by efforts to broaden the acceptance of the U.N. space treaties and to as-

sess their application. Each of these stages has been characterized by specific features and results.

In the first stage, when the LSC began its work, no binding instrument was in force within the international community for regulating the exploration and exploitation of outer space. Some authors argued that instant customary law was born, as was evidenced by a rapid practice of the spacefaring States, rather than by a general practice accepted as law, according to the traditional definition of international custom contained in Article 38 of the Statute of the International Court of Justice.[16] Apart from these doctrinal views, the General Assembly felt it necessary to give some guidance to member States conducting space activities. This was realized thanks to a declaration of principles, belonging to the *genus* of Assembly recommendations, which are endowed, in legal terms, with a merely hortatory value, as the General Assembly does not have a legislative or quasi-legislative function. However, the Assembly's "Declaration of Principles" or "Principles" *tout court*, are at the same time considered important tools in the process of evolving international law.[17]

Moreover, a legal foundation for space activities was needed as a matter of urgency in order to avoid the development of practices dictated exclusively by national interests. In this context, a *corpus* of general principles, to be translated later into a binding treaty, was the best way for coping with the Superpowers and their emerging space activities. In this way, the General Assembly adopted a resolution containing the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space.[18] The universal acceptance of these principles has consolidated their customary value, which can hardly be questioned even by the strictest and most positivistic test of legal effectiveness. International custom is generally considered to have two elements: *diuturnitas* and *opinio iuris*. The first refers to general and consistent conduct by States, while the

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[16] Bin Cheng, STUDIES IN INTERNATIONAL SPACE LAW, 191-196 (Oxford, 1997).

[17] See Gaetano Arangio-Ruiz, *The Normative Role of the United Nations and the Declaration of Principles of Friendly Relations*, *in* 137 RECUEIL DES COURS DE L'ACADEMIE DE DROIT INTERNATIONAL DE LA HAYE 419 (1972).

[18] Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, G.A. Res. 1962, 18th Sess. (1963).

second means that the practice stems from a belief of legal obligation. This definition helps to immediately underline the importance, in establishing the legal *status* of the Principles, of the conduct of States, international organizations, and private entities acting under the States' control and supervision according to international space law. In this regard, it can be argued that the practice of States seems to have confirmed the general aspects of the legal regime set forth in 1963 by the Principles.

While the adoption of an instrument not binding *per se* was seen as a first step towards a new legal regime for outer space, the time seemed mature for entering into multilateral treaties for clarifying and to progressively develop the rules to be applied to space activities. The LSC become the most appropriate forum for reaching consensus on the major issues involved and transforming such consensus on mandatory norms of international law.

These were the origins of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, generally called the Outer Space Treaty.[19] The LSC represented evidence of the commitment of States to the principle that international cooperation and the rule of law should always govern the exploration and peaceful uses of outer space.

The Outer Space Treaty became one of the outstanding lawmaking treaties of contemporary international law as a whole. It significantly contributed to the progressive development and codification in the meaning of Article 13 of the UN Charter.[20] By

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[19] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 (entered into force on Oct. 10, 1967) [hereinafter Outer Space Treaty].

[20] U.N. CHARTER, *supra* note 5, at art. 13.

> 1. The General Assembly shall initiate studies and make recommendations for the purpose of:
>
> a. promoting international co-operation in the political field and encouraging the progressive development of international law and its codification;
>
> b. promoting international co-operation in the economic, social, cultural, educational, and health fields, and assisting in the realization of human

the Outer Space Treaty, an attempt was made at finding a balanced compromise between the common interests of all nations, the aims of humankind as a whole, and the interests of individual States as members of the world community and traditional subjects of international law. It was agreed that "[t]he exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."[21]

The Outer Space Treaty establishes significant principles such as freedom in the exploration and use of outer space; freedom of scientific investigation in outer space; and, international cooperation in scientific investigation. The principle of non-appropriation,[22] relates to outer space as a whole, no exception having been admitted, and therefore no part of outer space, including the Moon or any other celestial body, can be exempted from the impact of this principle. It is indeed clear that space belongs to the category of *res communes omnium*, free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law.

The Outer Space Treaty also codified the principle of the denuclearisation of outer space, requiring States Parties "not to place in orbit around the earth any objects carrying nuclear weapons or any other kind of weapons of mass destruction, install such weapons on celestial bodies..." It also codified the principle of using the Moon and other celestial bodies exclusively for peaceful purposes.[23]

A special significance must be attached to the principle that State Parties "shall bare international responsibility for na-

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rights and fundamental freedoms for all without distinction as to race, sex, language, or religion.

2. The further responsibilities, functions and powers of the General Assembly with respect to matters mentioned in paragraph 1 (b) above are set forth in Chapters IX and X.

Id.

[21] Outer Space Treaty, *supra* note 19, at art. I.

[22] *Id.* at art. II.

[23] *Id.* at art. IV.

tional activities in outer space...whether such activities are carried on by governmental agencies or by non-governmental entities", and for "assuring that national activities are carried out in conformity with the provisions" of the Treaty.[24] This principle goes farther than the rules of general international law relating to State responsibility in the traditional sense. It is inappropriate, indeed, to interpret this notion by exclusive reference to the concept of responsibility of States for internationally wrongful acts, as it is addressed in the process of codification by the International Law Commission (ILC) of the United Nations. The ILC adopted, on second reading in 2001, the Draft Articles on the Responsibility of States. The Commission seeks to formulate, by way of codification and progressive development, the basic rules of international law concerning the responsibility of States for their wrongful acts.[25] Here, the emphasis is on the secondary rules of State responsibility, namely, the general conditions under international law for which States are responsible for wrongful actions or omissions and the legal consequences that flow from them.

Such interpretation appears too narrow, because the scope of Article VI would be only to include private activities that are carried out for governmental agencies and this would not be new. This inclusion also occurs under certain conditions at general international law. In fact, according to the customary rules on international responsibility for wrongful acts, States do not respond for private conduct, except for having neglected to take all reasonable measures to prevent private offensive acts from being committed or for having instructed or controlled private actions. Concerning the conduct directed or controlled by a State the ILC Draft establishes that "The conduct of a person or group of persons shall be considered an act of a State under international law if the person or group of persons is in fact acting

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[24] *Id.* at art. VI.

[25] International Law Commission, *Report on the Work of its Fifty-Third Session*, G.A. A56/10, at 29-365 (23 April - 1 June and 2 July - 10 August 2001).

on the instructions of, or under the control of, that State in carrying out the conduct."[26]

International responsibility, or better accountability according to Article VI, encompasses all the legal consequences of national activities in outer space, as provided for by international space law. It covers not only the obligation of reparation in case of violations of international obligations by public or private entities, but also the obligation to compensate for damage according to the special regime set forth in the Outer Space Treaty.[27] This is detailed in the Convention on International Liability for Damage Caused by Space Objects,[28] which depicts a victim-oriented discipline of absolute responsibility/strict liability for damages caused by space objects on the surface of the Earth or to aircraft in flight.[29] This responsibility – continues Article VI – pertains to assuring that national activities are carried out in conformity with the provisions set forth in the Outer Space Treaty. There is indeed a further consequence arising from the accountability provided for by Article VI, namely the recourse by a State to take legislative action at the national level in order to answer for private space activities and their legal consequences for which the State is internationally responsible. The general legal framework set up by the Outer Space Treaty has been complemented by four other treaties, all negotiated within the LSC, and following a method of a progressive elaboration of appropriate space law instruments.[30] In addition to the Regis-

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[26] Responsibility of States for Internationally Wrongful Acts, *id.* at art 8, p. 45 (draft text adopted by the International Law Commission at its fifty-third session. *See also* Luigi Condorelli, *La réparation des dommages catastrophiques causés par les activités spatiales*, LA REPARATION DES DOMMAGES CATASTROPHIQUES 270 (Bruxelles, 1990).

[27] Outer Space Treaty, *supra* note 19, at art. VII.

[28] Convention on the International Liability for Damage Caused by Space Objects, opened for signature Mar. 29, 19172, 24 U.S.T. 2389, 961 U.N.T.S 187 [hereinafter Liability Convention].

[29] *See* Armel Kerrest, *The Liability Convention and Liability for Space Activities*, *in* WORKSHOP ON CAPACITY BUILDING IN SPACE LAW, PROCEEDINGS ON CAPACITY BUILDING IN SPACE LAW, ST/SPACE/14, 27-32 (2003). *See also* MARCO PEDRAZZI, DANNI CAUSATI DA ATTIVITÀ SPAZIALI E RESPONSABILITÀ INTERNAZIONALE 259-267 (Milan, 1996).

[30] *See* Vladimir Kopal, *Introduction to the United Nations Treaties and Principles on Outer Space*, *in* WORKSHOP ON CAPACITY BUILDING IN SPACE LAW, PROCEEDINGS ON CAPACITY BUILDING IN SPACE LAW, ST/SPACE/14, 11-25 (2003).

tration Convention[31] and the Liability Convention[32] mentioned above, they also include the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space;[33] and, the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.[34] Under the legal framework of these treaties, space exploration by nations, international organizations and private entities has flourished. As a result, space technology and services might better contribute to economic growth and improvements in the quality of life around the world.

However, it must be said that the world remains far from general acceptance of the United Nations space law instruments. Many non space faring States have not yet accepted the key treaties, including some members of COPUOS. This is the reason why one of the main functions of the LSC is broadening the universal acceptance of the core space law treaties, inviting States to consider the reasons why their ratification and implementation should be considered highly beneficial. At the same time, the LSC should also encourage States that have accepted these conventions to look at the sufficiency of their national laws to implement them.

The Moon Treaty is a case apart. It has been accepted but by 10 States, failing to collect wider support. Notwithstanding that, like the other United Nations space treaties, it was adopted in the UN General Assembly by consensus. There are many reasons for the hesitation shown by a great number States to adhere to the Moon Treaty, but the most evident is perhaps the contradiction between the legal qualification of outer space, including the Moon and other celestial bodies, as *res communis omnium* under the Outer Space Treaty and the

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[31] Registration Convention, *supra* note 14.

[32] Liability Convention, *supra* note 28.

[33] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Apr. 22, 1968, U.N. GAOR, 22nd Sess., Supp. No. 16, at 5, U.N. Doc. A/6716 (1968), 19 U.S.T. 7570, 1968 U.S.T. LEXIS 584 [hereinafter Rescue Agreement].

[34] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, U.N. GAOR, 34th Sess., Supp. No. 46, at 77, U.N. Doc. A/34/46 (1980), 18 I.L.M. 1434 [hereinafter Moon Treaty].

legal regime of the Moon and its resources provided for by the Moon Treaty. The latter utilizes the concept of common heritage of humankind, which in principle excludes any other type of exploitation but collective through an international authority.[35] The notion of the common heritage of humankind has been adopted in the United Nations Convention on the Law of the Sea[36] for qualifying the sea bed and ocean floor and subsoil thereof beyond national jurisdiction and for setting up the International Sea Bed Authority, the body through which States Parties organise and control the activities concerned with seabed minerals.[37] The Moon Agreement requires also the exploitation of the natural resources of the Moon to be governed by a future "international legal regime,"[38] and its full establishment has been postponed until "such exploitation is about to become feasible."[39]

In this sense, it is a matter of fact that at the end of the 1970s the LSC concluded its law-making era with one of the most controversial legal regime of all international space law.

III. THE SECOND PHASE: THE SOFT LAW PRINCIPLES

Though the elaboration of further United Nations space treaties was discontinued after 1979, the work of the LSC in the progressive development of the juridical regime of outer space was not interrupted. The five main United Nations treaties exhausted the basic issues on which States would consent to undertake international legal obligations. During the following period, sets of United Nations Principles adopted by the General Assembly became a suitable form for regulating some special categories of space activities for which the international community was not yet prepared to negotiate legally binding instruments.[40]

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[35] See KEMAL BASLAR, THE CONCEPT OF THE COMMON HERITAGE OF MANKIND IN INTERNATIONAL LAW (The Hague-Boston, London, 1998).

[36] United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 3 (entered into force Nov. 16, 1994).

[37] R.R. CHURCHILL & A.V. LOWE, THE LAW OF THE SEA, 236-253 (Manchester, 2002).

[38] Moon Treaty, *supra* note 34, at art. 11(5).

[39] *Id.*

[40] STEPHEN GOROVE, DEVELOPMENTS IN SPACE LAW. ISSUES AND POLICIES 293-302 (Dordrecht, Boston, London, 1991).

A new phase began, which witnessed the adoption of declarations of principles as the viable solution to regulate more specific issues, such as the use of artificial satellites for international direct television broadcasting, remote sensing, and the use of nuclear power sources in outer space.[41] In this sense, the intention of the drafters of the Principles was exactly to adopt mere declarations not binding *per se*.[42]

During this period, four sets of Principles were negotiated by the LSC and then approved, through the main Committee, by the General Assembly of the United Nations. They are the Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting;[43] the Principles Relating to Remote Sensing of the Earth from Outer Space;[44] the Principles Relevant to the Use of Nuclear Power Sources in Outer Space[45] and the 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.[46]

As regards the legal *status* of these Principles, although being merely recommendations, they can pave the way for the consolidation of customary rules of international law. In this perspective, the decisive element comes from the practice of States prior to, concomitant with, and following the United Na-

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[41] *See* United Nations, Office for Outer Space Affairs, *United Nations Treaties and Principles on Outer Space: Text and Status of Treaties and Principles Governing the Activities of States in the Exploration and Use of Outer Space*, A/AC.105/572/rev. 3 (2000).

[42] See Vladimir Kopal, *The Role of the United Nations Declarations of Principles in the Progressive Development of Space Law*, 16 J. SPACE L. 5-20 (1988).

[43] Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, Dec. 10, 1982, UN Doc. A/Res/37/92. G.A. Res. 37/92, U.N. GAOR, 37th Sess., Supp. No. 51, at 98, U.N. Doc. A/37/51 [hereinafter DBS Principles].

[44] Principles Relating to Remote Sensing of the Earth from Outer Space, Dec. 3, 1986, U.N. GAOR, 41st Sess., Supp. No. 53, at 115, U.N. Doc. A/41/53 (1986) [hereinafter Remote Sensing Principles].

[45] Principles Relevant to the Use of Nuclear Power Sources in Outer Space, Dec. 14, 1992, U.N. Doc. A/Res/47/68 [hereinafter NPS Principles].

[46] 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, Dec. 13, 1996, U.N. Doc. A/Res/51/122 [hereinafter Benefit Principles].

tions recommendation process. Therefore, some of them seem more firmly established in law, like the freedom of Earth's observation from space, while others seem to be less consolidated, and still in the process of gaining complete legal relevance.

If we look for instance at Remote Sensing Principles, they seem to be a successful achievement in which a fair compromise was found between the interests of the sensing States and the needs of the sensed States, including most of the developing countries.[47]

At the time of their adoption, the Remote Sensing Principles did not prohibit activities that had been going on for a long time. On the contrary, they accepted the fact that sensing States were committed to the view that their activity required no consent, including no preliminary consent from sensed States. Therefore, the Remote Sensing Principles merely codified well-established conduct of States prior to 1986 and the General Assembly Resolution created no new law, but simply gave greater legitimacy to the already existing practices.

Additionally, practice seems to have confirmed the general and main aspects of the legal regime set forth in 1986. United States legislation has incorporated the principle of non-discriminatory access in both the Land Remote Sensing Commercialization Act of 1984 and the Land Remote Sensing Policy Act of 1992.[48] Other countries have followed this general tendency. The official policies of the European Space Agency (ESA) concerning ERS/ENVISAT distribution of data, respectively of 1994 and 1998, are unequivocal. The provision of data to users is regulated as follows: "ERS/ENVISAT primary data shall be available in an open and non-discriminatory way, in line with the UN Principles on remote sensing."[49]

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[47] Sergio Marchisio, *The 1986 United Nations Principles on Remote Sensing: A Critical Assessment*, *in* II SCRITTI IN ONORE DI GAETANO ARANGIO-RUIZ 1311-1340 (Naples, 2004).

[48] *See* Joanne Irene Gabrynowicz., *Defining Data Availability for Commercial Remote Sensing Systems under United States Federal Law*, 23 ANNALS OF AIR AND SPACE LAW 95 – 96 (1998).

[49] Marco Ferrazzani, *The European Distribution System (ERS)*, *in* DROIT, TELEDETECTION ET ENVIRONNEMENT 115 (Strasbourg, Actes Du Colloque International: Le Droit Face Aux Tecniques De Teledetection Par Satellite Au Service Du Developement, June 2-4, 1993).

Similar clauses have been included in multilateral agreements concluded by national space agencies, *inter se*, the Co-operation Agreement concerning the Vegetation program on SPOT 4, signed by the French *Centre National d'Etudes Spatiales* (CNES), the European Commission, the Italian Space Agency (ASI), the Belgian Federal Office for Scientific, Technical and Cultural Affairs (OSTC) and the Swedish National Space Board (SNSB) on 25 May 1994, and the following agreement of 1997-98 concerning the exploitation phase of the same program. The preambles to both agreements contain explicit recognition of the "Principles governing the exploration and use of outer space defined by the United Nations treaties and the principles adopted by the General Assembly relating to the remote sensing of the Earth from space."[50]

On the one hand, a cursory look at the practice of States and international organizations shows a situation in which the core tenets of the Remote Sensing Principles have maintained their importance, even in an emerging commercialized remote sensing system of services.[51] Indeed, they appear relevant to the expansion of those very services, and have been consistently reaffirmed. The basic international regime of remote sensing is recognized and must be preserved, promoting the broadest possible use of data.

On the other hand, it is true that some of the most prominent issues connected to recent and ongoing developments in the field of remote sensing, mainly societal demands and technological developments, are not fully regulated by the UN code on remote sensing.[52] The Remote Sensing Principles do not provide clear and specific regulations for new issues, such as the focus on global systems, access to data by sensed States and the

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[50] The Co-operation Agreement Concerning the Vegetation program on SPOT 4, signed May 25, 1994, and the subsequent agreement of 1997-98, were provided by the Italian Space Agency to the author and are on file with the author.

[51] PROCEEDINGS OF THE FIRST INTERNATIONAL CONFERENCE ON THE STATE OF REMOTE SENSING, (Joanne Irene Gabrynowicz ed., University of Mississippi School of Law, 2002).

[52] Joanne Irene Gabrynowicz, *Expanding Global Remote Sensing Services: Three Fundamental Considerations. Discussion Paper*, in PROCEEDINGS OF THE WORKSHOP ON SPACE LAW IN THE TWENTY-FIRST CENTURY 99 (International Institute of Space Law & United Nations Office for Outer Space Affairs, New York, 2000).

legal protection of data, which is increasingly necessary to promote the costly investments required by remote sensing activities and the expansion of the related market. Nor do they provide an adequate discipline as regards the production, use and treatment of highly sophisticated and detailed imagery, especially in relation to their potential implications for national security and individual privacy.[53]

As it has been pointed out, the UN Principles took the form of a General Assembly resolution and not, as was hoped by some States, a treaty, with the result that the principles, instead of being intended to constitute conventional rules legally binding as such upon those that accepted them, are merely guidelines. However, the compromise enshrined in the principles was intended by the drafters to serve as a first step in a law-making process that would eventually conclude in a formal treaty. In this regard, the practice of States seems to have confirmed the general and main aspects of the legal regime set forth in 1986 by the Principles and that some of them seem more firmly established in international customary law, while others seem to be less consolidated.[54]

Apart from that, there are two main reasons why the transposition of the Remote Sensing Principles into a binding treaty has never been concretely discussed, despite repeated proposals to the LSC for such discussion. First, the LSC is not in a law-making phase: that era of its activity ended at the beginning of the 1980s, and there currently is no political will to enter into new agreements. Rather, the current goal is to broaden the acceptance of the treaties in force or to better define issues relating to them. Secondly, although the Remote Sensing Principles were adopted by *consensus*, the agreement reached stemmed from several compromises, and not from a uniformity of views. Therefore, there are risks in starting discussions about incorporating the Remote Sensing Principles into a new treaty.

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[53] *See* JOHN C. BAKER ET AL., COMMERCIAL OBSERVATION SATELLITES. AT THE LEADING EDGE OF GLOBAL TRANSPARENCY (Rand Corporation, Arlington, 2001).

[54] *See* Sergio Marchisio, *Remote Sensing for Sustainable Development in International Law*, *in* AN OUTLOOK ON OUTER SPACE LAW IN THE COMING 30 YEARS 335-350 (Gabriel Lafferranderie, Dordrecht, Boston, London, 1997).

There is of course another option and this is to re-open a debate on a more limited issue, namely the desirability of reviewing the Remote Sensing Principles. This option has the merit of not questioning the soft-law character of the Principles. Probably, a third option could be presented, concerning the analysis of the current practices of both sensing and sensed States in a more limited perspective, with a view to assess how the key statements contained in the Remote Sensing Principles have been implemented and identifying the obstacles that hamper their full application. These options are currently before the LSC for future potential action in this field.

The NPS Principles was but a limited achievement in space legislation. Some innovative elements were brought into the regulation of these activities, such as the storing NPS objects in sufficiently high orbits after the operational part of their missions ends and providing for a safety assessment and notification of re-entry. The NPS Principles, however, must apply, only to "nuclear power sources devoted to the generation of electric power on board space objects for non-propulsive purposes, which have characteristics generally comparable to those of systems used and missions performed at the time of the adoption of the Principles".[55]

Therefore, the NPS Principles are not applicable to the NPS serving other purposes, including nuclear propulsion for long-distance flights into interplanetary space and to the celestial bodies of our solar system. The expected reopening of the NPS Principles, which was promised to be effected no later than two years after their adoption,[56] has been delayed several times.

The final document of this series, the Benefit Principles, mostly reflects the existing practice of international space cooperation and does not include new regulatory principles.

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[55] NPS Principles, *supra* note 45, at Preamble,

[56] *Id.* at Principle 11.

IV. THE THIRD PHASE AND FURTHER POSSIBLE DEVELOPMENTS WITHIN COPUOS

It is commonly understood that the current phase of the UNCOPUOS LSC is mainly devoted to the assessment of the existing legal regimes and undoubtedly oriented towards the formulation of non-binding documents that are based upon the rights and obligations as provided by the treaties already in force. Such trend is of a broader character in the United Nations system. After the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III),[57] some objectives for further development of legal matters to be initiated through the LSC were agreed upon. A more flexible agenda-structure in the LSC Subcommittee, as well as in the STS, was adopted. At the same time, however, it was reaffirmed that the structure did not allow the LSC to elaborate any proposals for the revision of existing legal norms or to provide authoritative interpretations to the space treaties. On the contrary, the new input for the LSC was limited to carry out the analysis of problems and shortcomings with respect to the application of existing rules of space law.

In this perspective, the LSC has moved toward the assessment of several regular items of relevance, beginning with the *status* and application of the five United Nations treaties on outer space. The review of the implementation of the treaties has confirmed that several obstacles hamper their universal acceptance especially by non-space-faring States and has certainly contributed to the further increase of ratifications.

Among regular items, for years the LSC has had in its agenda the issue of the definition and delimitation of "outer space". But attempts to adopt a legally binding delimitation between airspace and outer space, or at least to agree on a recommended interpretation of these notions, have failed. The attempts at bringing new light to consideration of these issues by studying the legal aspects of aerospace objects and sub-orbital

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[57] For information on the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) (Vienna, July 19-30, 1999), *see* http://www.oosa.unvienna.org/unisp-3/index.html (last visited June 13, 2005).

flights, which was undertaken in COPUOS' LSC in recent years, have not led thus far to any generally accepted conclusions.

Under the scope of the same item, definition and delimitation of outer space, the LSC has also been occupied for years by discussions on the legal status of the Geostationary Satellite Orbit (GSO). In this vein, I would like to mention the importance of the agreement reached in 2000 within the LSC on some aspects concerning the use of the geostationary orbit and making reference to the ITU rules.[58] In my opinion, this agreement evidenced the tacit abandonment by the equatorial States of their previous claims of sovereignty over the GSO.

Another important initiative concerned the draft UNIDROIT[59] Protocol on Space Assets to the 2001 Cape Town Convention on International Interests in Mobile Equipment,[60] introduced within the LSC at the request of Italy. In fact, from the beginning space law has been mostly involved with international and national law of a public nature (treaties, customary international law, national legislation). But the commercialisation of space activities has progressively led to a new dimension characterised by the emergence of private law regimes applicable to the relations among State actors and private entities or private entities *inter se*. The involvement of private law regulations (civil law, contracts) has also had consequences from the perspective of private international law, for the determination of the applicable law to a certain space activity, or to an element of it, and to the corresponding legal relations between the parties. At the same time, international practice shows a tendency toward the harmonisation or unification of civil law regimes

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[58] Some Aspects Concerning the Use of the Geostationary Orbit. April 2000, paper adopted by the COPUOS Legal Subcommittee, U.N. Doc. A/AC.105/738, at Annex III.

[59] UNIDROIT is the acronym for International Institute for the Unification of Private Law, an intergovernmental organization based in Rome which aims at the unification of private law among member States. On the 2001 Cape Town Convention, *see* ROY GOODE, OFFICIAL COMMENTARY ON THE CONVENTION ON INTERNATIONAL INTERESTS IN MOBILE EQUIPMENT AND PROTOCOL THERETO ON MATTERS SPECIFIC TO AIRCRAFT EQUIPMENT (International Institute for the Unification of Private Law, Rome, 2002).

[60] Convention on International Interests in Mobile Equipment, Nov. 16, 2001, *available at* http://www.unidroit.org/english/conventions/mobile-equipment/mobile-equipment.pdf (last visited July 18, 2005).

among States in order to facilitate private relations in space activities.

The Protocol is in fact concerned with private law issues. It will also be, as the Convention is, an instrument of public international law. However, it is more a tool for establishing a set of *uniform* rules for the protection of private investments in space activities of a transnational character (that is, rules of identical content within the internal legal systems of the States Parties), rather than as an instrument of private international law. It aims to redress the situation under which the legal regimes of many countries do not at provide enforceable and protective systems for the creation, perfection, prioritization and enforcement of security interests, mortgages and hypothecs over space equipment, such as satellites, and their component parts, such as transponders. In order to facilitate the financing of space assets that were manufactured, transported and ultimately located outside the jurisdiction of a country, there is a need for clear rules governing the granting of security where the collateral is located and where the borrower has its place of business. The Protocol intends to fill the gap originated by the lack of such clear rules that makes satellite financing more difficult and more expensive for satellite operators to secure.[61]

In order to achieve its aims, the Protocol provides (together with the Cape Town Convention, which will apply only if not derogated by the *lex specialis* contained in the Protocol) uniform rules to cover the period right through from the start of manufacturing to launch and thereafter. The underlying principles of this international instrument are indeed the agreements covered by the Protocol, the requirements for creating an international interests, the connection factors (private international law), the priorities of registered interests and the basic remedies provided for (possession or control, sell or lease of the object, income or profits from use of it) and the procedures established by the applicable law for the institution of proceedings before the courts to exercise remedies.

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[61] Sergio Marchisio, *Le protocole spatial d'Unidroit*, 12 GEO-OBSERVATEUR 30-34 (Sept. 2002).

The LSC has been involved with the Protocol dealing with two main issues: the relation between the Protocol and space law, and the possibility for the United Nations to act as the Supervisory Authority of the Registration system. The consideration of the first set of problems by the LSC focussed on the consistency of this regime of private law with the basic tenets of international space law. In this perspective, it opened for discussion on the most critical issues, such as the definition of space assets, liability, jurisdiction, limitations on transfers of controlled space assets and public law regulations regarding operating space objects, namely the public services regimes. At the same time, the LSC has considered the registrar and the supervisory authority from an institutional point of view, taking into account the process of negotiation currently going on for the identification of the most appropriate supervisory authority and the most viable system of registration for international interests in space assets. For the time being, however, no *consensus* could be reached among LSC member States on the appropriateness of the United Nations, through the Office for Outer Space Affairs, to act as the supervisory authority for the Protocol.

Another issue on the agenda of the LSC that has been considered in recent years was the "Application of the concept of the 'launching State'". The purpose of this work was to clarify all aspects of the "launching State" concept as contained in the Liability and the Registration Conventions, and as applied by States and international organizations, in the light of new and expected practices in space activities.

In 2004, during the first year of my chairmanship, a draft resolution on the application of the concept of the "launching State" was adopted by the LSC and finally approved.[62] The resolution reminds that it did not constitute an authoritative interpretation of, or proposed amendments to, the Liability and Registration Conventions. It mainly recommends that States consider enacting national legislation on authorization and supervision of space activities by private entities and the conclusion of agreements with respect to joint-launches.

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[62] Application of the Concept of the "Launching State", G.A. Res. 59/155 (Dec. 10, 2004).

From 2004, under a new three-year-work plan, the LSC is now considering the practice of States and international organizations in registering space objects, a sensitive issue, and characterized by a practice that shows the existence of certain *lacunae iuris* in the Registration Convention, mainly due to the commercial uses of outer space as well as to the privatisation of space activities.[63] The assessment of current practice by States reveals strong disparities regarding information concerning the territory of launch, the basic orbital parameters and the general function of a spacecraft. Moreover, practice shows that there are still several unregistered space objects or registered by more than one State. The debate is now open on how to fill these gaps and to obtain a more uniform application of the Registration Convention, the main aim of which, it must be recalled, is to help the identification of space objects and of the launching State.

Apart from that, the LSC is now looking for its *raison d'etre* in the new Millennium. This tendency is evidenced by the difficulty among member States to reach agreement on new issues to be considered: protection of the space environment; space debris; space tourism; a comprehensive convention on space law; commercialization of space activities; property rights for extracted resources of the Moon and other celestial bodies; the so-called militarization of space; intellectual property rights in space; the development of an international convention based on the Remote Sensing Principles; updating those Principles and to develop rules for the situations resulting from technological innovations and commercial application. In this perspective, I think we must consider that re-opening a new law-making phase of the LSC seems hardly feasible.

There are two main reasons, in my opinion, why the elaboration of new binding treaties has never been accepted, despite repeated proposals for such discussions. First, the existing treaties stemmed from several compromises, and not from a uniformity of views. Therefore, there are risks in starting discus-

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[63] Stephan Hobe et.al., *Current Issues in the Registration of Space Objects, in* PROJECT 2001 PLUS GLOBAL AND EUROPEAN CHALLENGES FOR AIR AND SPACE LAW AT THE EDGE OF THE 21ST CENTURY, PROCEEDINGS OF THE WORKSHOP 20-21 (Jan. 2005).

sions about new treaties, as this may re-open the debate on the already agreed upon issues. Only exceptional events could lead the LSC to reconsider its role as law-maker in the current phase of its evolution.

Secondly, the soft-law seems better able to accommodate the ongoing evolution in the field of technology. As the experience of specialised institutions shows, a real drive in this sense can come by technical norms. Specialised agencies have truly contributed, and continue to do so, to the evolution of law, by means of regulatory standards and recommended practices. Some of them have binding effectiveness, others have to be implemented by States through domestic acts. Probably the LSC should consider its possible role in the elaboration of technical norms on space matters.[64] The idea of drafting by both COPUOS sub-committees on an ordinary functional basis of international recommendations and standards is certainly fascinating, but would require profound changes from the institutional point of view.

In conclusion, the activity of the LSC has been of fundamental importance for space law. It has been the cradle where the basic principles and concepts of space law have been created and enshrined in the general founding treaties. The role of the LSC is certainly not over. It continues to form the most suitable environment to promote the assessment of existing space law and, potentially, the development of new norms by virtue of its universality and overall competence.

In its work the LSC should always reflect the goals and priorities pursued by the entire United Nations system. It should highlight the legal implications of those space activities that support sustainable development for all.

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[64] See Nasindiri Jasentulyana, *Strengthening International Space Law: the Role of the United Nations, in International Organisatons and Space Law: Their Role and Contributions*, 3 PROC. ECSL COLLOQUIUM 87-95 (Noordwijk, 1999).

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Keishunna Randall[*]
Jamie Rutland[**]

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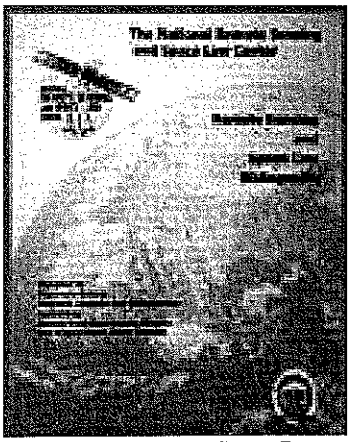

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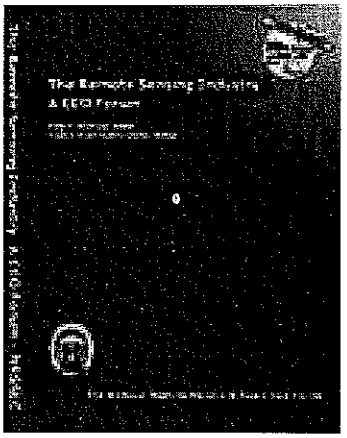

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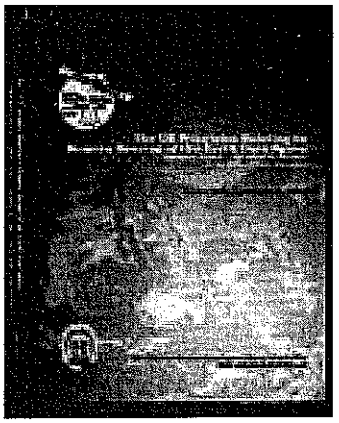

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