> States have not objected to the flight of artificial earth satellites above their territories in outer space nor to the ascent or descent of foreign space objects though undoubtedly some of these may have passed through their territorial air spaces. It is not certain how many times such a passage may have occurred since the upper boundary of national territorial air space so far has not been determined by international agreement or international customary law. If there is an international customary law, it is based on common perceptions and shared expectations of international authoritative decision-makers regarding such passage and supported by cardinal principle of freedom of exploration and use of outer space embedded in the Outer Space Treaty of 1967 and generally recognized to the extent and in line with existing state practice.[23]

In response to another question however, Gorove indicated that, "to the extent that States have not objected to the flight of artificial satellites above their territories in outer space nor to the ascent or descent of space objects through their national air spaces in the situations where such have occurred, a limited international custom with legal implications seems to have emerged (emphasis added - A.T.).[24]

In the opinion of Almond, "the current customary international law has not been fully established as to the regulation of the passage of space objects through foreign airspace, even including the ascent or descent of space objects."[25]

Christol provided the following answer: "If the question is whether a space object has the right under customary international law to transit through foreign sovereign airspace while the space object is engaged in ascent from the territory of a launching/procuring State and while returning to the territory of a launching/procuring State, the answer is `Yes'."[26]

Dembling answered that "taken literally, I would say that customary international law does not apply with respect to the passage of space objects during ascent or descent from outer space."[27]

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23 *Id.* at 110-111.

24 *Id.* at 114.

25 *Id.* at 111. Almond's response also contains interesting remarks on the origin and evolution of customary international law in general.

26 *Id.* at 112.

27 *Id.*

Finch's answer was the briefest: "Yes."[28]

V. UN Questionnaire on aerospace objects

In accordance with the decision of COPUOS, the Questionnaire was only circulated to members of COPUOS which is currently comprised of 61 States. At the time of the writing of this paper 14 substantive[29] responses had been received by the UN.

In the Questionnaire, Question 7 read as follows: "Are there precedents with respect to the passage of aerospace objects after re-entry into the Earth's atmosphere and does international customary law exist with respect to such passage?".

In response to that question, the following views were communicated to the United Nations Secretariat by Member States.

The Czech Republic indicated that, "in the doctrine of space law there has not yet been sufficient support for the conclusion that the right of passage for the ascending or descending space objects has been generally recognized as a customary rule of international law. In practice, however, such passage occurs and no protests against it have been raised so far."[30]

Germany stated that, "no international customary law exists with respect to the passage of space transportation systems *over foreign territory*, since no international practice in this respect exists."[31]

Iraq responded that "no such precedents are traced with respect to Iraq."[32]

In the opinion of Mexico, such "precedents exist and examples include the falling of space objects in Canada and Australia, among others."[33]

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28 *Id.*

29 United Kingdom of Great Britain and Northern Ireland sent an intermediate response as follows: "The Government of the United Kingdom acknowledges the importance of the subject and the future possible implications of considering legal issues in this area of aerospace objects, but regrets to inform the Secretary-General that the questionnaire is still under active discussion in both national and European contexts. The matter will be kept under close review and an agreed response to the questionnaire will be forwarded to the Committee on the Peaceful Uses of Outer Space in due course." (UN doc. A/AC.105/635/Add.3 of 1 December 1996, at 11).

30 *Supra* note 13, at 10.

31 *Id.* at 11.

32 *Id.*

33 *Id.*

Pakistan stated that "there are several examples of such incidents" including "re-entry of Apollo 13/SNAP 27... in 1970," "the falling down of the Soviet NPS-carrying satellite COSMOS-954 on 24 January 1978...," "reentry of Skylab" in 1979, "accident of COSMOS-1402 in 1982-83." Pakistan also stated that "no specific international customary law exists, to our knowledge, with respect to such passage of aerospace objects over foreign territories."[34]

The Philippines reported that "it is not aware of any precedent with respect to the passage of aerospace objects after re-entry into Earth's atmosphere."[35]

The Republic of Korea's position was that "there are no international customary laws or precedents with respect to the passage of an aerospace object after re-entry in to the Earth's atmosphere" (emphasis added). As for the space objects, the Republic of Korea's response indicated that

> Until now many space objects were launched into outer space, but it does not mean that its passage over [perhaps what is meant here and in the next sentence is "through" not "over" - A.T.] airspace after re-entry into the Earth's atmosphere constitutes any precedent or customary law. The fact that most of the countries did not raise any objection to the passage of space objects over their airspace does not signify their approval of the passage as international practice or precedents; they just did not have information about the passage and there was no special perceptible disadvantage with the passage at that time.[36]

In the view of the Russian Federation,

> There are such precedents [of the passage of aerospace objects after re-entry into Earth's atmosphere. - A.T.]. According to the international practice which is now evolving, a State's sovereignty does not extend to the space located above the orbit of least perigee of an artificial Earth satellite (approximately 100 km above sea level). There have been relatively few instances of space objects flying over territories of foreign States. In cases where the object has flown at an altitude below the above-mentioned level, the registering States have furnished the relevant information to the States whose territory was thus overflown

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34 *Id.*

35 *Id.*

36 *Supra* note 14, at 6.

> on the basis of goodwill. For example, [then followed the text describing the March 1990 Atlantis flight over the USSR - see above - A.T.]

The response of the Russian Federation continued by stating that "provisions of international customary law with respect to the passage of aerospace objects after re-entry into the Earths atmosphere are currently in the process of being elaborated" ("in the process of being elaborated" is an imprecise translation from Russian; the better translation is "evolving" - A.T.).[37]

Responding to the question concerning precedents and customary law, Italy expressed the opinion that "the issue should be re-examined keeping into account solutions mentioned at points 2 and 6."[38]

Chile stated that "there are indeed precedents relating to aerospace objects, such as space shuttles, in respect of their aerodynamic characteristics. Similarly, customary law does exist with respect to such aerospace objects, whereby they are regarded as craft performing a space mission to which the norms of air law do not apply."[39]

In the view of Greece, "re-entries into Earth's atmosphere of all United States Space Shuttles, which were successively flown above the national airspace of many third States, may be considered as precedents of a kind of innocent passage. Thus, due to the fact that no objection or opposition was raised by these States, it follows that an international customary law right was then created with respect to such passage, as it happened earlier in the case of the first artificial Earth satellite."[40]

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37 *Id. at* 6-7.

38 UN doc. A/AC.105/635/Add.2 of 18 March 1996, at 4. In response to question 2 (Does the regime applicable to the flight of aerospace objects differ according to whether it is located in airspace or outer space?), Italy indicated that "...on the basis of present technical results, the so-called `aerospace object' is conceived as and destined to a unitary function, meant for activities in outer space. the operational circumstances of crossing the Earth's atmosphere does not affect the mission's singleness under a unified regime". In response to question 6 (Are the norms of international and international air law applicable to an aerospace object of one State while it is in the airspace of another State?), Italy responded that "keeping particularly in account the phase of re-entry into atmosphere and the relevant flights activities of the `aerospace object', while observing the unified character of the above mission which prevents a positive answer to question 6, it is advisable to examine such flight activity with respect to the existing rules of air navigation in order to solve possible interferences." *Id.* at 3-4.

39 UN doc. A/AC.105/635/Add.3 of 1 December 1996, at 9.

40 *Id.*

Republic of Kazakstan's response did not address the customary law issue and merely indicated that "yes, there are precedents for such passage involving space objects of the Russian Federation. Such passage was provided for under the Agreement between the Russian Federation and the Republic of Kazakstan of 28 March 1994 on the Main Principles and Conditions for Utilization of the Baikonur Launch Site."[41]

Syrian Arab Republic stated that "no specific international customary law exists, with respect to such passage of aerospace objects over foreign territories. No such precedents are traced with respect to Syria."[42]

Turkey responded that "there are a number of incidents where fragments of space objects have fallen onto 'unwelcomed' territories. However, to our knowledge there are no well defined international practices in such cases. Some regulations need to be established."[43]

"Legal and policy issues raised by the UN Questionnaire on Aerospace Objects" were discussed at the 90th Annual Meeting of the American Society of International Law (ASIL) on 30 March 1996. The International Space Law Interest Group of ASIL, consisting of Harry Almond, Jr., Edward R. Finch, Jr. and Paul G. Dembling, provided comments with regard to various issues raised in the Questionnaire, including passage through airspace. On this particular issue, as reported by Stephen Gorove, Chairman of ASIL Committee on International Space Law, "the participants appeared to agree that - as long as the object's primary function was to operate as a spacecraft - its safe passage to and from outer space has now attained the status of international customary law."[44]

VI. Analysis

In view of the above-cited definitions of international legal custom, it is necessary to determine whether the passage of aerospace (or space) objects through foreign airspace satisfies the requirements of generality, consistency, uniformity and *opinio juris* to qualify as international legal custom.

Since renewed interest in this particular problem has arisen in connection with the above UN Questionnaire, it appears pertinent to carry out this analysis on the basis of the relevant question posed in the questionnaire, *i.e.*: "Are there precedents with respect to the passage of aerospace objects after re-entry into the Earth's atmosphere and does

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41 *Id.*

42 *Id.*

43 *Id.*

44 S. Gorove, *Legal and Policy Issues Raised by the UN. Questionnaire on Aerospace Objects*, 24 J. SPACE L. 53 (1996).

international customary law exist with respect to such passage?". The formulation of the question contains a number of ambiguities which should be kept in mind while addressing the substance of the question.

First, Member States are requested to report on precedents with respect to the passage of aerospace objects. While there is no agreed definition of either the term "space object" or the term "aerospace object", there appears to be a general agreement that the latter does not yet exist and is only being developed by some countries. Space shuttle-type objects, which immediately come to mind in this context, are universally recognized to be space, not aerospace, objects, the recognition of which is supported by state practice during the many years of space-shuttle operations.[45] Therefore, no above-referred precedents can possibly exist because aerospace objects themselves are non-existent.

Second, the expression "the passage of aerospace objects after re-entry into the Earth's atmosphere" misses the point of the problem. Even if one was to assume, for the sake of argument, that the space shuttle is an aerospace object, the fact that during landing the United States shuttle craft traverses long distances in United States airspace, does not pose any international legal problem. The problem is not with the passage of such objects through airspace *per se,* but rather through foreign airspace.

One additional difficulty in attempting to respond to the above question is of course the absence of a universally agreed upon boundary between airspace and outer space: one cannot say with certainty at which altitude an object's flight should be legally considered as occurring in airspace, and not in outer space. There exists, however, a general recognition that orbiting Earth satellites do indeed fly in outer space, and, accordingly, the boundary between airspace and outer space cannot possibly be higher than the lowest perigee of an orbiting satellite, *i.e.*, around 100 kilometers above sea level.[46]

With the above clarifications in mind, it should be stated that, as far as aerospace objects are concerned, the answer to the above question is obvious: since such aerospace vehicles do not yet exist, their operation cannot possibly be characterized as customary. Accordingly, there are no international legal customary rules regulating the passage of such objects through the airspace of foreign States or, in fact, regulating any other aspects of aerospace object operation.

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[45] Suffice to say that all launches of space shuttle-type vehicles were registered in accordance with the Convention on Registration of Objects Launched into Outer Space of 14 January 1975 (The Registration Convention: 28 U.S.T. 695, T.I.A.S. 8480, 1023 U.N.T.S. 15, entered into force on 15 September 1976) which instrument is designed for registration of space objects.

[46] V.S. Vereshchetin, *Next Steps in International Space Law, in* PERSPECTIVES ON INTERNATIONAL LAW 471-72 (Nandasiri Jasentuliyana ed., Kluwer Law International 1995).

Of course already existing customary norms for activities in outer space and/or in airspace, if any, will be applicable to aerospace objects when they become operational and fly in outer space or in airspace, respectively. However, as will be shown below, rights of passage through foreign airspace are not among those norms.

As far as space objects are concerned, the case is more complex.

Indeed, three specific situations should be distinguished while examining the question of the passage of space objects through airspace.

First, artificial Earth satellites, after the end of their active life, regularly re-enter the dense layers of the atmosphere over foreign states and either burn up completely or fall down, usually in a disintegrated form, to the Earth's surface. The legality of such "passage" through foreign airspace has never been challenged as illegal by states, except, as far as this author is aware, on a single occasion - the "Cosmos 954" incident.[47] However, it appears that those cases of impact should not be qualified as "passage" referred to in the above questionnaire because the term "passage" implies a flight of an operational object, not a falling of space debris. The principal difference here is that the falling of satellites or their component parts cannot be controlled or prevented by the launching State, while the flight of an operational vehicle is of course something which can be controlled or prevented, as the case may be.

The second situation concerns space objects which pass through foreign airspace unintentionally as a result of accident, error, malfunction, etc. For such situations, existing outer space agreements contain provisions implying the right of passage of both piloted and unmanned space objects through foreign airspace.[48] The 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (the Rescue Agreement)[49] provides that the personnel of a spacecraft, which has landed in a foreign territory due to accident, distress, emergency or unintended landing, must be safely and promptly returned to the launching authority. Article 5 of the Rescue Agreement regulates questions of the return of unmanned space objects returned to Earth in a foreign territory, to the launching authority. The 1972 Convention on the International Liability for Damage Caused by Space

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[47] The only exception known to this author is "Cosmos 954" incident: *see* A.D. Terekhov, *Passage of space objects through foreign airspace*, 32 PROC. 51 (1990).; *see also* A.D. Terekhov, *International Liability for Damage Caused by Space Objects with Nuclear Power Sources on Board*, 35 PROC. 151-62 (1993).

[48] *See* A.D. Terekhov, *Passage of space objects through foreign airspace*, 32 PROC.50-55 (1990).

[49] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 22 April 1968, 19 U.S.T. 7570, T.I.A.S. 6599, 672 U.N.T.S. 119 (entered into force 3 December 1968).

Objects (the Liability Convention)[50] provides for compensation for such damage on the surface of Earth and to aircraft in flight, but does not consider the passage *per se* of a space object through foreign airspace as illegal. The implicit right to pass through foreign airspace may also be found in the provisions of the Registration Convention dealing with the question of identifying space objects that have landed in foreign territory.

The third situation involves intentional flights of fully operational space objects through foreign airspace. As mentioned above, not much information is available concerning intentional pre-planned flights of operational space objects through foreign airspace. The United States which currently has the only functional space transportation system capable of such flights, the Space Shuttle, has not responded to the UN Questionnaire so far. At the same time it is noteworthy that in describing a specific case of one such flight over its territory, the Russian Federation indicated that "information received [by the USSR from the US]... was transmitted as a courtesy. An agreement was reached establishing that the fact that this information was furnished should not be deemed to set a precedent".[51] There is no doubt that "courtesy" in this context did not and could not mean an international legal obligation. Moreover, the two states even explicitly agreed that the provision of the above information did not set "a precedent" - a *conditio sine qua non* for an emerging custom if it is indeed evolving, as claimed by some.

The fact that such a wide variety of differing views with regard to the existence, or the absence of a customary rule of law for the passage of space objects through foreign airspace is being expressed, both by sovereign states and in legal doctrine, is by itself the best evidence that no such custom has so far developed. Presumably, this is true because international custom is based on a constant and uniform practice recognized in international law as having a legally binding character. Currently there is no proof of such state practice or of the recognition in international law, of the legally-binding right of passage.

It appears that there may be a certain degree of misunderstanding on the part of those scholars who believe that a right of passage or transit of space objects through foreign airspace has become or is becoming a customary rule of international law. This misunderstanding perhaps originates from the fact that since the beginning of the space era there have been no protests against defunct satellites entering the upper layers of the atmosphere over foreign states after the end of their active life, and either burning up completely or even having some of the debris reaching the surface.

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[50] Convention on International Liability for Damage Caused by Space Objects, 29 March 1972, 24 U.S.T. 2398, T.I.A.S. 7762, 961 U.N.T.S. 187 (entered into force 1 September 1972).

[51] *Supra* note 14, at 5.

Indeed those numerous occurrences are treated by States as acceptable. However, this fact does not mean that a new customary norm of international law has developed or is emerging for the following two reasons.

First, as indicated above, the existing outer space agreements obviously imply the right of a space object to fall down on a foreign territory. The Outer Space Treaty, the Rescue Agreement, the Liability Convention and the Registration Convention contain specific provisions obligating a State on whose territory such objects or their component part have been discovered, to take specific actions. While those actions may be different depending on the circumstances of each particular incident, the fact itself that an object or its part has fallen down on foreign soil is not considered in those agreements as a violation of international law. Thus the "right to fall down" for space objects should be viewed as a conventional right and not as a customary norm.

Second, there is a big difference between defunct satellites or malfunctioning manned craft landing helplessly in foreign countries, and fully operational vehicles making a pre-planned intentional passage through foreign airspace. There is little doubt that, hypothetically, had such a passage taken place today "on the basis of a customary norm of international law", the state concerned would disagree that it is obliged to accept such a flight in its airspace because allegedly there is such a custom.

Finally, there is one more consideration which should be kept in mind while examining the issue of passage through foreign airspace. All such passages (for the most part, not actually passages but rather falling down) occurred in the direction from outer space to the surface of Earth. Even if one was to admit, for the sake of argument, that some kind of a custom has indeed evolved with regard to passage of space objects through foreign airspace, such a "customary norm" would be rather one-sided, *i.e.*, it would apply only to flights from outer space to Earth, but not *vice versa*.

Vereshchetin observed that:

> There are reasons to suggest that the future utilization of aerospace planes of different configurations would not diminish but would, instead, increase the concerns of States over their national security, commercial interests, safety of air traffic, environmental protection, etc. Hence, the issue of a formal treaty, to distinguish airspace from outer space will not lose its significance with advent of aerospace planes. Conversely, the significance of this issue could increase because the transit of aerospace planes through foreign airspace would become a frequent occurrence.[52]

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[52] *Supra* note 40, at 471.

Currently, however, the level of sophistication of space transportation systems is such that they are not capable of making meaningful flights through airspace. Moreover, in order for the only existing vehicle of this type, the US Space Shuttle, to fulfill its mission, such flights through foreign airspace are hardly necessary. It is not surprising, therefore, that there are very few cases of such passage. In view of the above arguments, it is too early to speak about the emergence of a general, consistent and uniform state practice in this field of international relations, as well as of *opinio juris*, leading to the establishment of a new rule of customary international law - the right of passage of space objects through foreign airspace.

VII. Conclusions

On the basis of the foregoing, the following conclusions may be formulated:

- There are no international legal customary rules regulating the passage of aerospace objects through foreign airspace due to the fact alone that no aerospace objects have been developed so far: if something has never been used, there can be no custom for using it.

- The re-entry of artificial Earth satellites, after the end of their active life, into the dense layers of atmosphere over foreign states and/or the falling down of such satellites, usually in a disintegrated form and naturally through airspace, onto the surface of Earth, is legal. The existing outer space agreements imply the right of a space object to fall down on a foreign territory.

- The existing outer space agreements contain provisions implying the right of passage of both piloted and unmanned space objects through foreign airspace as a result of accident, error, malfunction, etc.

- The very limited number of cases of flights of operational space objects through foreign airspace makes it premature to state that a customary legal norm has developed whereby a state has a right to carry out such flights without the consent of the underlying state.

- The absence of such a customary norm of international law is confirmed by the opposing views on the subject expressed both by states and in legal doctrine.

THE USE OF NUCLEAR POWER SOURCES IN OUTER SPACE AND ITS EFFECT ON ENVIRONMENTAL PROTECTION

R. I. R. Abeyratne*

Introduction

The COSMOS 954 incident of January 1978 -- where a Soviet satellite disintegrated over Northern Canada -- brought to bear the relevance of environmental protection as a corollary to the exploration of outer space. The accident scattered debris over 600 kilometres of Canadian territory, most of which was found to be radioactive. Two subsequent incidents -- the first relating to the re-entry of COSMOS 1402 into the Earth's atmosphere in early 1983 and the second relating to COSMOS 1960 in 1988 -- endorsed the concern of the world community on environmental issues which are related to the exploration of outer space.[1] These incidents also underscored the fact that the primary pollutant in activities related to nuclear power sources in outer space is radioactivity caused by nuclear waste which is released both in outer space and in the environment.

The limited *Nuclear Test Ban Treaty*[2] which is the seminal document that provides for environmental protection against radioactivity caused by nuclear waste, provides in its Article 1 that States Parties to the Treaty undertake to prohibit, to prevent and not carry out any nuclear weapon test explosion, or any other nuclear explosion, at any place under its jurisdiction or control or *inter alia* in outer space or in any other environment if such explosion causes radioactive debris to be present outside the territorial limits of the State under whose jurisdiction or control such explosion is conducted.[3] The Treaty further provides that no State Party may collaborate with or encourage such activity.[4]

The *Outer Space Treaty*,[5] while expostulating the fundamental principle in its Article 1 that the exploration and use of outer space,

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1 For a detailed discussion of these incidents, *see* INTERNATIONAL SPACE LAW IN THE MAKING, FORUM FOR AIR AND SPACE LAW 19-22 (Marietta Benkö & Kai-Uwe Schrogl eds., Editions Frontières 1993).

2 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Over Water, Aug. 5, 1963, 480 U.N.T.S. 45, 45.

3 *Id.* Art. 1(a) and (b).

4 *Id.* Art. 2.

5 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27 1967, 610 U.N.T.S. 205 (hereinafter "Outer Space Treaty").

including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, explicitly imposes in Article VII international liability and responsibility on each State Party to the Treaty, for damage caused to another State Party or to its populace (whether natural or juridical) by the launch or procurement of launch of an object into outer space. In its preceding provisions the Treaty imposes international responsibility on States Parties for national activities conducted in outer space. The Treaty also requires its States Parties to be guided by the principle of co-operation and mutual assistance in the conduct of all their activities in outer space.[6] This overall principle is further elucidated in the same provision: "States Parties to the Treaty shall pursue studies of outer space, including the moon and other celestial bodies, and conduct exploration of them so as to avoid harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extra terrestrial matter."[7]

The *Moon Agreement*[8] of 1979 provides that in the exploration and use of the moon, States Parties shall take measures *inter alia* to avoid harmfully affecting the environment of the earth through the introduction of extra terrestrial matter or otherwise.[9]

The United Nations Conference on the Human Environment, held in Stockholm in June 1972,[10] while recognizing that States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies,[11] require States to co-operate in the further development of international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of States to areas beyond their jurisdiction.

Liability and Responsibility of States

The *Liability Convention* [12] contains a provision which lays down the legal remedy in instances of damage caused by Space objects. Article II provides: "A launching State shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to

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6 *Id.* Art. IX

7 *Id.*

8 Agreement Governing the Activities of States on the Moon and other Celestial Bodies, Dec. 5 1979, U.N. Doc. A/RES/34/68 (1979).

9 *Id.* Art. 7.

10 For text of the United Nations Conference on the Human Environment, adopted June 16, 1972, see U.N. Doc. A/CONF.48/14 and Corr. 1, *reported in* 11 I.L.M. 1416.

11 *Id.* Principle 21.

12 Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, T.I.A.S. No. 7762.

aircraft in flight,"[13] thereby imposing a regime of absolute liability on the State that launches space objects such as satellites, which provide technology and communication that is used for air navigational purposes. Although admittedly, both the *Outer Space Treaty* and the *Liability Convention* do not explicitly provide for damage caused by technology and communication provided by space objects, culpability arising from the "common interest" principle and liability provisions of the two conventions can be imputed to States under these Conventions.

Gorove states that in the field of international space law, two clearly connected terms have been used: liability and responsibility.[14] Although "responsibility" has not been cohesively interpreted in any legal treaty relating to outer space, "liability" occurs in the *Liability Convention* and is sufficiently clear therein. This, however, does not mean that State responsibility is not relevant to the obligations of States' law as, in international relations, the invasion of a right or other legal interest of one subject of the law by another inevitably creates legal responsibility. Professor Brownlie observes:

> [T]oday, one can regard responsibility as a general principle of international law, a concomitant of substantive rules and of the supposition that acts and omissions may be categorized as illegal by reference to the rules establishing rights and duties. Shortly, the law of responsibility is concerned with the incidence and consequence of illegal acts, and particularly the payment of compensation for loss caused.[15]

International responsibility relates both to breaches of treaty provisions and other breaches of legal duty. In the *Spanish Zone of Morocco Claims* case, Justice Huber observed: Responsibility is the necessary corollary of a right. All rights of an international character involve international responsibility. If the obligation in question is not met, responsibility entails the duty to make reparation.[16]

There is also explicit recognition that principles of international law apply to space law. The General Assembly of the United Nations in 1961 adopted the view that international law, including the Charter of the United Nations, applies to outer space and celestial bodies.[17] It is also now

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[13] Article II(a) defines damage as including loss of life, personal injury or other impairment of health; or loss or damage to property of States or of persons natural or juridical, or property of international governmental organizations.

[14] Stephen Gorove, *Liability in Space Law: An Overview*, 8 ANNALS AIR & SPACE L. 373 (1983).

[15] IAN BROWNLIE, PRINCIPLES OF PUBLIC INTERNATIONAL LAW 433 (4th ed., Clarendon Press 1990).

[16] *1925 RIAA ii* 615, 641.

[17] Resolution 1721 (XVI), *adopted* Dec. 20, 1961. *See also* Art. III of the Outer Space

recognized as a principle of international law that the breach of a duty involves an obligation to make reparation appropriately and adequately. This reparation is regarded as the indispensable complement of a failure to apply a convention and is applied as an inarticulate premise that need not be stated in the breached convention itself.[18] The ICJ affirmed this principle in 1949 in the *Corfu Channel* case[19] by holding that Albania was responsible under international law to pay compensation to the United Kingdom for not warning that Albania had laid mines in Albanian waters which caused explosions, damaging ships belonging to the United Kingdom. Since the treaty law provisions of liability and the general principles of international law as discussed complement each other in endorsing the liability of States to compensate for damage caused by space objects, there is no contention as to whether in the use of nuclear power sources in outer space, damage caused by the uses of space objects or use thereof would not go uncompensated. The rationale for the award of compensation is explicitly included in Article XII of the *Liability Convention* which requires that the person aggrieved or injured should be restored (by the award of compensation to him) to the condition in which he would have been if the damage had not occurred. Furthermore, under the principles of international law, moral damages based on pain, suffering and humiliation, as well as on other considerations, are considered recoverable.[20]

As discussed, both treaty law and general principles of international law on the subject of space law make the two elements of liability and responsibility a means to an end - that of awarding compensation to an aggrieved State or other subject under the law. Therefore, in view of the many legal issues that may arise, the primary purpose of a regulatory body which sets standards on State liability in issues concerning the use of space technology would be to carefully consider the subtleties of responsibility and liability and explore their consequences on States and others involved as they apply to the overall concept of the status of a State as a user of space technology which may cause harm or injury to the latter.

The basic principle of space law is the "common interest" principle which emerged as a result of the first specific Resolution on space law of the United Nations General Assembly in 1958.[21] The "common interest" principle has since been incorporated in subsequent multilateral treaties, particularly the *Outer Space Treaty* of 1967,[22] Article 1(1) of which provides: "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind." This provision,

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Treaty, *supra* note 5.

18 In Re Chorzow Factory (Jurisdiction) Case, 1927 P.C.I.J. (Ser. A) No. 9, at 21.

19 1949 I.C.J. 4, at 23.

20 CARL Q. CHRISTOL, SPACE LAW PAST, PRESENT AND FUTURE 231 (Kluwer 1991).

21 G.A. Res. 1348 (XII) (1958).

22 *Supra* note 5.

which binds signatory States, is seemingly a departure from the traditional "national interest" approach of international law and has represented a moral obligation to some,[23] while to others the provision has represented a *jus cogens* or mandatory legal principle.[24]

The International Court of Justice (ICJ), in the *North Sea Continental Shelf* case,[25] held that legal principles that are incorporated in Treaties, such as the "common interest" principle, become customary international law by virtue of Article 38 of the 1969 Vienna Convention on the Law of Treaties. Article 38 recognizes that a rule set forth in a treaty would become binding upon a third State as a customary rule of international law if it is generally recognized by the States concerned as such. Article 1(1) of the *Outer Space Treaty*, which designates that the use of space technology is achieved under the "common interest" principle for the common good of humanity, therefore becomes a principle of customary international law, or *jus cogens*. Obligations arising from *jus cogens* are considered applicable *erga omnes* which would mean that States using space technology owe a duty of care to the world at large in the provision of such technology. The ICJ in the *Barcelona Traction Case* held:

> [A]n essential distinction should be drawn between the obligations of a State towards the international community as a whole, and those arising *vis a vis* another State in the field of diplomatic protection. By their very nature, the former are the concerns of all States. In view of the importance of the rights involved, all States can be held to have a legal interest in their protection; they are obligations *erga omnes*.[26]

The International Law Commission has observed of the ICJ decision: "In the Courts view, there are in fact a number, albeit limited, of international obligations which, by reason of their importance to the international community as a whole, are - unlike others - obligations in respect of which all States have legal interest."[27]

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[23] D. Goedhuis, *Some Substantive and Procedural Issues Presently at Stake in Space Legislation*, 25 ZEITSCHRIFT F. LUFT- & WELTRAUMRECHT (GERMAN J. AIR & SPACE L.) 195, 198-199 (1976); Bin Cheng, *The 1967 Space Treaty*, 95 J. DROIT INT'L 532, 578 (1968).

[24] M.G. Markoff, *Disarmament and 'Peaceful Purposes' Provisions in the 1967 Outer Space Treaty*, 4 J. SPACE L. 3 (1976). *See also* N.M. Matte, *Aerospace Law: Telecommunications Satellites*, 166 R.C.A.D.I. 119, 147 (1980); R.S. JAKHU, DEVELOPING COUNTRIES AND THE FUNDAMENTAL PRINCIPLES OF INTERNATIONAL SPACE LAW 351 (Girardot *et al.* eds.); C.Q. Christol, *The Jus Cogens Principle and International Space Law*, 26 PROC. COLLOQ. L. OUTER SPACE 1 (1983).

[25] 1970 I.C.J. 32.

[26] Barcelona Traction, Light and Power Company Limited, 1974 I.C.J. 253, 269-270.

[27] 2 Y.B. Int'l L. Comm'n 29 (Pt. 1, 1976).

The views of the ICJ and the International Law Commission, which has supported the approach taken by the ICJ, give rise to two possible conclusions relating to *jus cogens* and its resultant obligations *erga omnes*:

a) obligations *erga omnes* affect all States and thus cannot be made inapplicable to a State or group of States by an exclusive clause in a treaty or other document reflecting legal obligations without the consent of the international community as a whole;

b) obligations *erga omnes* preempt other obligations which may be incompatible with them.

Some examples of obligations *erga omnes* cited by the ICJ are prohibition of acts of aggression, genocide, slavery and discrimination.[28] It is indeed worthy of note that all these obligations are derivatives of norms which are *jus cogens* at international law.

If it can be accepted that a principle of *jus cogens* creates obligations *erga omnes*, it becomes an undeniable fact that Article 1(1) of the *Outer Space Treaty* could be considered a peremptory norm or *jus cogens,* since it generates obligations towards the international community as a whole. Christol observes:

> Article 1 Paragraph 1 of the Space Treaty, with its adoption of the common benefits and interests guarantee, can be supported (as an example of peremptory norms) because the provisions conform to moral law in the sense that all humankind is to benefit unconditionally, and because the terms are consistent with the spirit and the purposes identified in Article 1 Pars. 1 through 3 and Article 2 pars. 1 through 4 of the UN Charter, as well as with complimentary international agreements of lesser authority. To the extent that the terms are beneficial to individuals, the larger community, and States, and when the provisions are found on the fundamental moral principles contained in the foregoing paragraphs of Article 1 and 2 of the UN Charter, such basic principles qualify for the status of peremptory norms of general international law.[29]

The effect of this observation is that the content and nature of Article 1 (1) confirms that it is a *jus cogens.* There is seemingly no reason why the international community should not give such recognition to the "common interest" principle as enshrined in Article 1(1) which is aimed at the protection of the interests of the international community as a whole. *A fortiori*, on the same basis, Article IX of the *Outer Space Treaty* which

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[28] 1970 I.C.J. 32.

[29] Christol, *op. cit., supra* note 20, at 6.

requires that States should avoid harmful contamination and adverse change in the environment of the Earth which may result from the exploration of outer space would incontrovertibly be considered *jus cogens*.

Article VI of the *Outer Space Treaty* provides in part that State Parties to the Treaty shall bear international responsibility for national activities in outer space, whether such activities are carried out by governmental agencies or non-governmental agencies. This provision clearly introduces the notion of strict liability *erga omnes* to the application of the *jus cogens* principle relating to outer space activities of States and could be considered applicable in instances where States hold out to the international community as providers of technology achieved and used by them in outer space, which is used for purposes of air navigation. Article VI further requires that the activities of non-governmental entities in outer space shall require authorization and continuing supervision by the appropriate State Party to the Treaty, thus ensuring that the State whose nationality the entity bears would be vicariously answerable for the activities of that organization, thereby imputing liability to the State concerned.

Article VII makes a State Party internationally liable to another State Party for damage caused by a space object launched by that State.

The *Registration Convention* of 1974[30] in Article II(1) requires a launching State of a space object that is launched into earth orbit or beyond, to register such space object by means of an entry in an appropriate registry which it shall maintains and inform the Secretary General of the United Nations of the establishment of such a registry. This provision ensures that the international community is kept aware of which State is responsible for which space object and enables the United Nations to observe outer space activities of States. Article VI of the Convention makes it an obligation of all State Parties, including those that possess space monitoring and tracking facilities, to render assistance in identifying a space object which causes damage to other space objects or persons. Justice Manfred Lachs analyzes these provisions of the *Registration Convention* to mean that the State of registry and the location of the space object would govern jurisdictional issues arising out of the legal status of space objects.[31] On the issue of joint launching of space objects, Justice Lachs observes:

> No difficulties arise whenever a State launches its own object from its own territory; the same applies to objects owned or launched by non-governmental agencies registered in that State. However, in cases of joint launching, agreement between the parties is required as to which of them is to be deemed the "State of Registry". A similar agreement is also

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[30] Convention on Registration of Objects Launched into Outer Space, *adopted by* U.N.G.A. Nov. 12, 1974, 1023 U.N.T.S. 15.

[31] MANFRED LACHS, THE LAW OF OUTER SPACE, AN EXPERIENCE IN CONTEMPORARY LAW MAKING 70 (Sijthoff Leiden 1972).

> necessary when a launching is carried out by an international organization.[32]

The above provision ensures the identification of parties responsible for specific activities in outer space and thereby makes it easier to impose liability for environmental damage caused.

Application of International Environmental Law to Outer Space Exploration

Justice Manfred Lachs was of the view:

> If all the activities connected with outer space are to be conducted for the benefit of all and to the detriment of none, international co-operation is essential, and if all the possibilities opened up are to be used in a responsible manner, the conduct of States in regard to outer space must be submitted to the rule of law.[33]

Although Judge Lachs' observation was indubitably meant to convey the need for global co-operation in issues of outer space exploration in the broadest possible sense, it is relevant in the present context that this visionary statement could be segmented to apply to corollaries of outer space activities as well, such as the environmental impact of nuclear power sources in outer space. In a determination of this narrow area, the emergence of environmental law as a necessary adjunct to the burgeoning world order of today becomes a compelling issue.

It is indeed inevitable that advances in space technology and co-operation in outer space exploration would raise issues requiring the environmental impact of these developments. At the same time, it is fortunate that an international order governing environmental protection has emerged to offer solutions to the problems that may arise from those activities. The effectiveness of international environmental law as it applies to outer space exploration therefore becomes the pivotal consideration.

The application of environmental law to outer space activities lies in the fundamental postulate that outer space is free for exploration and use by all States without discrimination of any kind and on a basis of equality.[34] This principle lays down the freedom of action for all States on the basis of the prohibition of discrimination; the recognition of equality of all States; and the requirement that the activities be conducted in accordance with international law.[35] The last element - accordance with international law - derives its validity from the 1963 *Declaration of Legal Principles Governing*

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[32] *Id.*

[33] Manfred Lachs, *op. cit., supra* note 31, at 6-7.

[34] *See* Moon Treaty, *supra* note 8, art. 1, para. 2.

[35] Manfred Lachs, *supra* note 31, at 44-45.

the Activities of States in the Exploration and Use of Outer Space wherein States parties declared in unequivocal terms that their governments would respect the principles of the Declaration,[36] which essentially established the general principle of international co-operation and adherence to customary international law in outer space exploration. This leaves no room for doubt that international environmental law, like the space treaties discussed above, would be inextricably applicable to space law.

In December 1992, the United Nations General Assembly adopted Resolution 47/68[37] which provides that activities involving the use of nuclear power sources in outer space shall be carried out in accordance with international law including in principle the charter of the United Nations and the *Outer Space Treaty*. The treaty also provides that, in order to minimize the quantity of radioactive material in space and the risks involved, the use of nuclear power sources in outer space shall be restricted to those space space missions which cannot be operated by non nuclear sources in a reasonable way. Among the more notable provisions of the treaty are those providing for assistance to States, whereby all States possessing space monitoring and tracking facilities to communicate to the Secretary General of the United Nations and the States concerned information of space objects with a nuclear power source entering the atmosphere; international responsibility of States for national activities in outer space involving nuclear power sources and liability and compensation.

The cornerstone of international environmental law is the Rio Declaration[38] which is a statement of basic principles emanating from the United Nations Conference on Environmental Development held in Rio de Janeiro in June 1992. The Rio Declaration endorses and updates Principle 21 of the Stockholm Declaration, which provides a delicate but harmonious balance of recognizing the inalienable rights of all States to exploit their own resources pursuant to their own environmental and developmental policies while at the same time recognizing their responsibility to ensure that activities within their jurisdiction and control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction[39].

The Rio Declaration explicitly places common but differentiated responsibilities on States on the subject of environmental protection by exhorting developed countries to be internationally responsible in their international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and

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[36] *Id.* at 138.

[37] U.N.G.A. Res. 47/68, *Principles Relevant to the Use of Nuclear Power Sources in Outer Space*, UN Press Release GA/8470 148 (1993). *See also* Marietta Benkö & Kai-Uwe Schrogl, *supra* note 1, at 98-110.

[38] 21 I.L.M. 876 (1992). *See also* UNITED NATIONS, THE GLOBAL PARTNERSHIP FOR ENVIRONMENT AND DEVELOPMENT: A GUIDE TO AGENDA 21, at 1-4 (1992).

[39] Principle 2 of the Rio Declaration, *reprinted in* 21 I. L. M. 876 (1992).

financial resources they command.[40] The Rio Declaration also calls for the application of the "polluter pays" principle,[41] and *inter alia*, obliges States to undertake environmental impact assessment.[42]

Nanda observes:

> International environmental law has become probably the most vigorously evolving chapter in international law, in the form of global, regional and bilateral treaties; in the form of rapidly developing customary law; in the form of supernational directives (in the EU); and even more, in the form of various types of soft law.[43]

Therefore, as outer space exploration evolves with its characteristic rapidity, the need for international law to address specific issues becomes compelling. Environmental protection is one such issue, which requires urgent and short-term attention.

Conclusion

It has been said that three of the most important space law issues that the international community will have to deal with relate to manned space flights, future aerospace planes and the protection of the space environment.[44] Of these, space environment is arguably the most contentious, at least if one were to judge from the proliferation of legal material that has emanated from the scholars on the subject of contamination of the environment by by-products of space exploration.

The central treaty provision which refers to space environment is Article IX of the *Outer Space Treaty* which entreats States to avoid harmful contamination ot the environment of the Earth and also to ensure that there are no adverse changes in the environment as a result of their activities in outer space. As a stand-alone provision Article IX is impotent, in that it fails to definitively set standards or in the least leave room for a regulatory body to set standards in the field of space environment. For instance, Article IX provides that States shall where necessary, adopt measures for the above purpose. One has to go a bit further than this blanket statement if one were to ensure global cooperation in matters of space environment. As Jasentuliyana draws the analogy of the Annexes to the Chicago Convention in the field of regulation by ICAO in matters related to civil aviation:

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40 Rio Declaration, *Id.* Principle 7, at 877.

41 *Id.* Principle 16.

42 *Id.* Principle 17.

43 V. Nanda, *International Environmental Law and Policy, in* PERSPECTIVES IN INTERNATIONAL LAW 101 (N. Jasentuliyana ed., Kluwer 1995).

44 V.S. VERESHCHETIN, *Next Steps in International Space Law, in id.* at 463, 477.

> the technical Annexes to the Chicago Convention are one reason why ICAO has been so successful in international law making. Through the use of these Annexes, the Organization has been able to separate the political and technical facets of international civil aviation. To a large degree, uniformity in all technical and navigational aspects of international civil aviation has been achieved.[45]

Jasentuliyana takes his statement a step further when he recommends that the United Nations might develop a treaty with broad and general guidance for this purpose, leaving it to an international technical body to establish standards and recommended practices for States to follow.[46] This is a sound recommendation, not only because the commentator has chosen the closely related field of aviation as an analogy but also because the Annexes to the Chicago Convention have demonstrated their efficacy over the years as instruments of regulation. it must be noted that within the United Nations Law making system, not only the adoption of a treaty, but also its subsequent development has been proved to be important. Of course, such a project should be embarked upon after a carefully thought out assessment of the likelihood of success of such a treaty which will depend on the following:

1) the technical difficulty of the project and resolution of the scientific, technical, economic and other problems that may accompany the project;

2) the acceptability of the treaty to the organizations of States Parties and its effectiveness in implementation of its provision.

Although several specialized agencies of the United Nations system have procedures that modify, without eliminating, the positivist principle that States are normally bound only by international rules to which they have consented,[47] ICAO provides the best example of treaty development. The Chicago Convention authorizes the ICAO Council to adopt international standards and recommended practices (SARPS) as Annexes to the Convention. These SARPs have bestowed on the ICAO Council at least a quasi-legislative function and are highly authoritative in practice. They ensure safety and efficiency in air travel and are used widely by States, particularly in the context of Annex 2, which provides for Rules of the Air.

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[45] Nandasiri Jasentuliyana, *Celebrating Fifty Years of the Chicago Convention Twenty-Five Years after the Moon Landing: Lessons for Space Law*, 19 ANNALS AIR & SPACE L. 429, 444 (Pt. II, 1994).

[46] Nandasiri Jasentuliyana, *A Survey of Space Law as Developed by the United Nations*, *in* PERSPECTIVES ON INTERNATIONAL LAW 349, *supra* note 43, at 378.

[47] For details of regulation by United Nations specialized agencies, see Frederic L. Kirgis, *Specialized Law Making Processes*, *in* 1 UNITED NATIONS LEGAL ORDER 121-135 (O. Schachter & C.C. Joyner eds., Cambridge Univ. Press).

Therefore, although the analogy of the Annexes to the Chicago Convention is not necessarily a panacea to the perceived lacuna in the field of regulation of environmental protection in outer space exploration, it may well be a suitable starting point.