INTERNATIONAL LIABILITY FOR DAMAGE CAUSED BY SPACE OBJECTS WITH NUCLEAR POWER SOURCES ON BOARD

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Introduction

International liability for damage caused by space objects is one of the basic principles of international space law. The very first legal document on outer space elaborated in the United Nations and adopted in 1963 by the UN General Assembly contained a provision pursuant to which:

> "Each State which launches or procures the launching of an object into outer space, and each State from whose territory or facility an object is launched, is internationally liable for damage to a foreign State or to its natural or juridical persons by such object or its component parts on the Earth, in the air space, or in outer space."[1]

The above provision, with minor editorial changes, has subsequently become a part of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (the Outer Space Treaty),[2] which Article VII provided that:

> "Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the moon and other celestial bodies."

The obligations established by that Article have been developed and specified in the 1972 Convention on International Liability for Damage Caused by Space Objects (the Liability Convention).[3] The central obligation of that Convention is contained in Article II and establishes absolute liability of a launching State to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft in flight. Pursuant to Article III of the Convention, fault liability is envisioned for cases where damage is caused elsewhere than on the surface of the Earth to a space object of one launching State by a space object of another. The Convention contains definitions of certain terms, including the term "damage", and provides for various procedures and mechanisms required for resolving numerous questions in connection with damage caused by space objects.

At a certain stage of elaboration of the Principles Relevant to the Use of Nuclear Power Sources (NPS) in Outer Space in the UN Committee on the Peaceful Uses of Outer Space (COPUOS) it was decided that a

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principle dealing with the question of international liability for damage should be included in the draft. After years of deliberations, COPUOS, in 1991, reached consensus on a draft principle 9 "Liability and compensation".[4]

At its thirty-fifth session, in June 1992, COPUOS successfully concluded elaboration of the NPS Principles as a whole and recommended their adoption to the General Assembly.[5]

1972 Liability Convention and the use of NPS in outer space

Various subjects pertaining to international liability for damage caused by space objects, including the 1972 Liability Convention, were thoroughly examined and studied by many prominent scholars.[6] Therefore, this section will briefly deal with just one aspect - applicability of the Convention to nuclear damage.

Article I(a) of the Convention stipulates that, for the purpose of that instrument,

> "the term 'damage' means loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical or property of international intergovernmental organizations."

If the use of NPS in outer space results in damage as defined above, the Liability Convention would be fully applicable to such a case. The question of whether nuclear damage should be covered by the Convention was a matter of long disagreement among drafters of that instrument. Eventually, it was understood that the scope of the Convention encompasses nuclear damage.[7]

That understanding was reached the during final stages of work and did not require any modifications to the definition of "damage" which had much earlier been agreed to in the Legal Subcommittee of COPUOS, remained unchanged for a number of years and later became a provision of the Convention. That fact leads to the conclusion that its drafters did not see any difference between ordinary non-nuclear damage and nuclear damage for the purpose of the above definition.

For the Convention to be applicable, it does not matter whether, for example, a person was injured by a direct hit of a non-radioactive piece of space debris which survived the re-entry, or by radiation from an NPS satellite which accidentally landed on foreign territory. What matters is that in both cases personal injury, mentioned in Article I(a), has been inflicted, and this event makes the Convention applicable.

Perusal of the travaux preparatoire of the Convention shows that, while a lot of general words were said about the "entirely distinct nature" of nuclear damage,[8] the only practical difference mentioned in the debate was the delayed effects of nuclear damage, as compared to ordinary non-nuclear damage. As N. Jasentuliyana correctly remarked, "this matter is addressed in Article X, ...which provides for a flexible time limit for filing of claims."[9]

It should also be recalled that a number of international conventions on civil liability for nuclear damage[10] define "nuclear damage" precisely in the same terms as the Liability Convention.

Thus it may be concluded that, while nuclear and non-nuclear damage may differ in scope, severity, requirements for remedial measures and the presence or absence of delayed effects, the types of damage in both cases remain the same: loss of life, personal injury, damage to property, etc. Accordingly, the Liability Convention is without doubt applicable to NPS space objects causing damage as defined in its Article I(a).

COSMOS-954 incident

Renewed interest in the problem of international liability for damage caused by space objects was prompted by the COSMOS-954 incident. The Soviet satellite COSMOS-954, equipped with a small nuclear reactor, was launched on 18 January 1977.[11] On 6 January 1978, "sudden depressurization" of the satellite occurred as a result of which it began to "descend uncontrollably".[12] On 24 January 1978, COSMOS-954 re-entered the atmosphere over Canada and scattered radioactive debris on its northern territories. While not the only case of an NPS satellite failure in the history of space age,[13] this accident, which led to the appearance of radioactive debris on land, caused great concern and anxiety in the international community.

Fortunately, the area of impact of the COSMOS-954 debris was scarcely populated and nobody was hurt. Canada, assisted by the United States, has conducted successful search, recovery and clean-up operations.

The COSMOS-954 incident led to two developments directly relevant to the subject of the present paper: a Canadian claim against the Soviet Union for compensation for damage, and the elaboration of NPS Principles in COPUOS.

Canadian-Soviet settlement of COSMOS-954 incident

On 23 January 1979, Canada presented a claim against the Soviet Union for damage caused by the COSMOS-954 satellite in the amount of 6,041,174.70 Canadian dollars.[14]

The claim was "based jointly and separately on (a) the relevant agreements and in particular the 1972 Convention on International Liability for Damage Caused by Space Objects, to which both Canada and the Union of Soviet Socialist Republics are parties, and (b) general principles of international law".[15]

Canada claimed that "the deposit of hazardous debris from satellite throughout a large area of Canadian territory, and the presence of that debris in the environment rendering part of Canada's territory unfit for use, constituted 'damage to property' within the meaning of the Convention",[16] and that the liability of the USSR was "also founded in Article VII" of the Outer Space Treaty.[17]

As for the general principles of international law on which the claim was based, the Canadians stated that "the intrusion of the COSMOS-954 satellite into Canada's airspace and the deposit on Canadian territory of hazardous radioactive debris from the satellite constitutes a violation of Canada's sovereignty" which "gives rise to an obligation to pay compensation".[18] In addition, the claim stated that "the standard of absolute liability for space activities, in particular activities involving the use of nuclear energy, is considered to have become a general principle of international law... The principle of absolute liability applies to fields of activities having in common a high degree of risk".[19]

The claim was considered at Canadian-Soviet negotiations, and on 2 April 1981, having reached agreement, the representatives of the two Governments signed a Protocol envisioning that the USSR shall pay Canada 3 million Canadian dollars "in full and final settlement of all matters connected with the disintegration of the Soviet satellite COSMOS-954 in January 1978".[20]

Detailed examination of the claim goes beyond the scope of this paper. It is important, however, to determine whether the claim has been settled on the basis of the Liability Convention or not. The answer to this question seems to be of major significance for future application of the Convention, and for examining de lege lata

the question of international liability for damage caused by NPS space objects.

A wide variety of views have been expressed as to the applicability of the Liability Convention to the COSMOS-954 incident.

Shortly after the crash P.P.C. Haanappel observed that the Convention was inapplicable to the COSMOS-954 case because of the narrow definition of "damage" in Article I.[21] Similar views were expressed at that time by S. Gorove,[22] who later, however, admitted that, since the Soviet Union "paid damages" to Canada, the Convention was applicable to damage caused "to the elements of environment provided that they are property of a natural or juridical person".[23] N. Jasentuliyana expressed the view that the Convention "might not cover damage to the environment per se".[24] He Qizhi remarked that damage to environment is covered by the Convention as far as the environment "means the surface of the Earth under jurisdiction of states".[25] B. Schwartz and M.L. Berlin argued that "the nuclear contamination of Canadian territory was damage to 'persons and property' within the meaning of Article I(a) of the Liability Convention".[26] E. Galloway expressed the view that environmental damage "could" be covered by the Convention, if that damage "could cause" losses defined in Article I.[27] G. Gal, having referred to the COSMOS-954 case, observed that the definition of damage in the Convention "is scarcely applicable" to the harmful contamination of the environment.[28] N.M. Matte considered that "a launching state cannot be held liable for damage caused to the environment as a result of chemical, biological or radioactive contamination".[29] S. Courteix believed that "it is not clear whether nuclear hazards" are covered by the Liability Convention.[30] H.A. Baker stated that the Convention "was never applied" to the COSMOS-954 case.[31] B.A. Hurwitz expressed the view that "there can be no doubt" of the Convention's applicability to the incident under review.[32]

Some scholars seem to take it for granted that the COSMOS-954 case was settled on the basis of the Liability Convention.[33] The logic behind that conclusion is probably the following: Canada based its claim against the Soviet Union primarily on that Convention; the claim was settled and money was paid. Accordingly, the payment proves that the Liability Convention was applicable to the incident and, therefore, served as a legal basis for the settlement.

This conclusion, however, is erroneous.

To start with, the Canadian claim was based primarily, but not exclusively on the Liability Convention. This circumstance alone makes the determination of the legal basis of the actual settlement a difficult task. The fact that the payment was made does not necessarily mean that it was made in accordance with the Convention.

As indicated above, a number of legal authorities either denied or questioned the applicability of the Liability Convention to COSMOS-954 case. The crux of the problem here is whether the definition of "damage" in Article I(a) of the Convention encompasses negative effects of the incident, namely, scattering of the radioactive debris on Canadian territory. If, as the Canadian claim suggested, the territory is considered property for the purpose of the above definition, then the Convention is applicable, since the deposit of radioactive debris on that property damaged it by making the territory unfit for use. If, however, the territory (soil) is considered an element of the environment, then the Convention is hardly applicable, since pollution of the environment seems to be outside the scope of the Convention.

Unlike diplomatic correspondence on the issue, the records of the Canadian-Soviet negotiations have not been made public. It is, therefore, impossible to determine with full confidence what kind of specific concessions and compromises "paved the way" to the final settlement in the form of the above-mentioned Protocol. Yet certain

"circumstantial evidence" can be obtained from available documentation.

First, although the Canadian claim was based primarily on the Liability Convention, that instrument was not even mentioned in the Protocol which settled the claim. Moreover, the word "compensation" itself - the Convention's term - is not found in the text of the Protocol. All this is hardly an oversight. It is more logical to assume that in the course of the negotiations the two sides failed to agree that the Liability Convention was applicable to the incident. Had the sides agreed to settle the claim on the basis of the Convention, they would have definitely referred to it in the Protocol settling the claim. Besides, being parties to the Convention, both Canada and the Soviet Union would be interested in increasing the number of States participating in it, and unambiguous indication that the COSMOS-954 incident was settled on the basis of the Liability Convention would have been an excellent "promotion" of that instrument and a serious encouragement to accede to it for those States which have not yet done so.

Second, while there seem to be no publications containing references to the official Soviet position at the COSMOS-954 negotiations, at least one article describing the Canadian approach has been published.[34] The authors of that article referred to various questions raised during the Canadian-Soviet negotiations, including applicability of the Liability Convention to the COSMOS-954 case. They noted, in particular, that "Canada and the Soviet Union were able to reach a lump sum settlement without the need for agreement on the answers to these questions" (emphasis added - A.T.).[35] Thus, one of the directly involved parties confirmed that no agreement on the applicability of the Liability Convention to the COSMOS-954 case had been reached at the Canadian-Soviet negotiations.

Third, further evidence that the COSMOS-954 case was not settled on the basis of the Liability Convention is contained in principle 9 "Liability and compensation", approved by COPUOS at its 34th session in 1991.[36] While this principle will be examined in greater detail in a section below, a brief reference to its paragraph 3 is necessary in connection with the "applicability question". That paragraph provides that:

> "For the purpose of this principle, compensation shall include reimbursement of the duly substantiated expenses for search, recovery and clean-up operations, including expenses for assistance received from third parties".

Expenses mentioned above are exactly those incurred by Canada as a result of the COSMOS-954 crash. Inclusion of paragraph 3 in the principle on liability demonstrates that drafters did not view expenses for search, recovery and clean-up operations as covered by the Liability Convention. The beginning of that paragraph ("For the purpose of this principle") does not permit interpretation of it as merely a confirmation of an obligation already existing under the Liability Convention. It should be recalled in this connection that it was Canada who co-sponsored a working paper[37] which provided a basis for reaching consensus on principle 9 at the COPUOS session. Had the COSMOS-954 case been settled on the basis of the Liability Convention, Canada would have not included paragraph 3 in the working paper at all, or at least would have worded it in a different way.

The above considerations lead to the conclusion that the COSMOS-954 incident was not settled on the basis of the Liability Convention. This conclusion does not mean that the parties concerned could not use or should not have used the Convention as a legal basis for the settlement, they simply did not. To use the Convention as such a basis, the agreement of both parties was required - evidently, it was never reached.

Yet the approach suggested by S. Gorove[38] and He Qizhi[39] seems to be

quite justified: if a space object causes damage to the elements of the environment which are the property of a natural or juridical person, the Liability Convention should be applicable. However, the COSMOS-954 case cannot be considered as a precedent supporting such interpretation.

What was the legal basis of the COSMOS-954 settlement? As indicated above, Canada also based its claim on "general principles of international law". The scope of this paper does not allow a detailed analysis of this part of the Canadian claim. In brief, this author shares the view that "extra-conventional state practice does not support the contention that general or customary international law imposes on states absolute liability for damage, including environmental damage, caused by space objects on the surface of the Earth".[40] Similarly, for reasons which will be given below, the Outer Space Treaty could not have served as a legal basis for claiming compensation in connection with the case under review.

Thus, the COSMOS-954 case was not settled either on the basis of the Liability Convention or the Outer Space Treaty or general principles of international law - it was an ex gratia settlement.[41]

COPUOS principle on liability and compensation for damage caused by NPS space objects

Less than a month after the COSMOS-954 incident, on 13 February 1978, the fifteenth session of the Scientific and Technical Subcommittee of COPUOS was convened in New York. At that session, Canada, supported by many other delegations, proposed that the various implications of the incident should be "carefully and promptly" considered by COPUOS and its two Subcommittees.[42] That proposal became the first step towards elaboration, in the United Nations, of Principles relevant to the use of NPS in outer space.

The history of this long and arduous process has been examined in an excellent way by various legal experts,[43] including, in particular, both the current Director of the UN Office of Outer Space Affairs, Dr. N. Jasentuliyana[44] and his predecessor at that post, Prof. Dr. V. Kopal[45].

As mentioned above, at its 34th session in 1991, COPUOS reached consensus on principle 9, which read as follows:

"Principle 9 "Liability and compensation"

"1. In accordance with article VII 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, and the provisions of the Convention on International Liability for Damage Caused by Space Objects, each State which launches or procures the launching of a space object and each State from whose territory or facility a space object is launched shall be internationally liable for damage caused by such space objects or their component parts. This fully applies to the case of such a space object carrying a nuclear power source on board. Whenever two or more States jointly launch such a space object, they shall be jointly and severally liable for any damage caused, in accordance with article V of the above-mentioned Convention.

"2. The compensation that such State shall be liable to pay under the aforesaid Convention for damage shall be determined in accordance with international law and the principles of justice and equity in order to provide such

reparation in respect of the damage as will restore the person, natural or juridical, State or international organization on whose behalf a claim is presented to the condition which would have existed if the damage had not occurred.

"3. For the purpose of this principle, compensation shall include reimbursement of duly substantiated expenses for search, recovery and clean-up operations, including assistance received from third parties."[46]

The text of paragraph 1 of the above principle is based on the formulations of Article VII of the Outer Space Treaty and relevant provisions of the Liability Convention. Minor discrepancies are purely editorial and were not intended to have any legal implications. The objective of this paragraph is to confirm full applicability of the liability regime established by the two above-mentioned instruments to damage caused by space objects carrying NPS on board.

Since the paragraph under review refers not only to the Liability Convention, which has definition of the term "damage", but also to the Outer Space Treaty, which contains no such definition, it is necessary to determine whether the term "damage" for the purpose of principle 9 means something different as compared to relevant provisions of the Liability Convention. In other words, is the notion of damage in Article VII of the Outer Space Treaty wider than the definition contained in Article I of the Liability Convention?

The answer to this question is negative. As convincingly demonstrated by B. Schwartz and M.L. Berlin,[47] the Liability Convention was intended to make more precise the relevant provisions of the Outer Space Treaty and was supposed to state completely the rules covering damage by space objects. "The whole purpose of this process would be negated if states could resort to more ambiguous sources of international law, such as custom or the Outer Space Treaty, in an attempt to establish legal claims which find no support in the Liability Convention".[48] Thus, the reference to the Outer Space Treaty in paragraph 1 of principle 9 does not make the scope of coverage of that principle wider than that of the Liability Convention in connection with damage caused by NPS space objects.

The substantive text of paragraph 2 of principle 9 is a complete unchanged reproduction of Article XII of the Liability Convention. Since full applicability of the Convention (including, naturally, its Article XII) to space objects with NPS on board has been already confirmed in paragraph 1, the whole paragraph 2 might look superfluous. Its inclusion is probably explained by the drafters' wish to emphasize the importance of a full and equitable measure of compensation to victims, and "to bridge" paragraphs 1 and 3 since the latter also concerns the question of compensation.

It is noteworthy that, speaking about compensation, paragraph 2 mentions only the Liability Convention as the basis for receiving compensation, and does not refer to the Outer Space Treaty, although reference to its Article VII is made in paragraph 1. This approach of the drafters may serve as another argument supporting the view that, as stated above, the objective of the Liability Convention is to establish completely the rules for dealing with damage by space objects, and the Outer Space Treaty cannot serve as a legal basis for attempts to claim compensation different from that envisioned in the Liability Convention.

Provisions of paragraph 3 are new as compared to the "confirmation" character of the two preceding paragraphs. Paragraph 3 is an implicit response to the legal controversy of the COSMOS-954 incident and subsequent settlement of the Canadian claim against the Soviet Union. As mentioned above, its inclusion in the principle on

liability demonstrates that drafters of that principle did not consider expenses for search, recovery and clean-up operations as covered by the Liability Convention. If that was not the case, paragraph 3 would not have been included at all, or at least would have been formulated in a different way.[49]

It should be recalled that at the early stages of the debate, the delegation of Canada proposed formulations of a relevant draft principle which, if adopted, would support the view that search and clean-up expenses are covered by the Convention.[50] However, the eventual consensus on paragraph 3 of principle 9 supports the opposite interpretation.

It is important to realize that paragraph 3 does not equate expenses for search, recovery and clean-up operations with damage in the meaning of the Liability Convention. Pursuant to the Convention, damage is subject to compensation, while, pursuant to paragraph 3, the above expenses are subject to reimbursement to be included in the compensation. In other words, if, as a result of a space NPS incident, no damage, as defined in the Convention, was caused, but search, recovery and clean-up operations were conducted, the State which conducted those operations will be entitled, in accordance with paragraph 3, to receive reimbursement of relevant expenses, not compensation envisioned by the Liability Convention.

The above question might look purely linguistic, but it is not. The point here is that unless the above expenses are "accompanied" by damage, as defined by the Liability Convention, the latter remains unapplicable.

Inclusion of the words "duly substantiated" in paragraph 3 of principle 9 is aimed to protect the interests of a launching State by preventing unfounded or inflated claims. To a certain extent, those words are designed to play the same role in determining the amount of reimbursement, as reference to "principles of justice and equity" plays in determining the amount of compensation under the Liability Convention. In both cases the goal is to ensure that the eventual settlement is reasonable and satisfactory for all parties concerned, and is not a source of enrichment for the injured party.[51]

The relevant part of paragraph 3 contains the formulation "expenses for search, recovery and(emphasis added - A.T.) clean-up operations". It may be argued, therefore, that, since the word "and" (not "or") has been used by drafters, reimbursement may be claimed only if all three types of operations were actually carried out. Such interpretation, however, would be incorrect. Even if search operations have not led to recovery of any radioactive debris (which might have been lost, for example, on the bottom of a deep lake), it would be fair to reimburse expenses incurred during such "search only" operations, because they were needed to make sure that no real danger existed. By the same token, if an area of impact of a single large radioactive debris has been very accurately predicted, or the impact itself was witnessed and immediately reported to relevant authorities, no search operations would be required. Nevertheless, it is evident that in such a situation expenses for recovery and clean-up operations should be reimbursed. An attempt not to pay such expenses only because no search operations were needed would contradict the entire logic of principle 9.

The following situation can also occur. A launching State A notified a State B that a malfunctioning space object with NPS on board or its component parts will fall, according to State A's calculations, on State B's territory. After the impact, a State C, which borders State B, conducted, on its own initiative, search operations, but found nothing. Does paragraph 3 of draft principle 9 require that State C's expenses for such search operations be reimbursed by State A?

This question may have different answers depending on circumstances. Briefly,

if State C had valid reasons to believe that radioactive debris may or did fall on its territory, despite the calculations of State A, then the above expenses should perhaps be reimbursed. If no such valid reasons existed, then no reimbursement should be paid.

Finally, speaking of principle 9 as a whole, there is a question of States which are not parties either to the Outer Space Treaty or the Liability Convention. While at present NPS in outer space are believed to be used by States which are parties to the two above instruments, the situation may change in the future. Besides, any State may become a victim of a space NPS incident.

Hence, the question arises how a State which is not a party to the two above agreements should treat a legal provision envisioning that this State shall be internationally liable for damage in accordance with those agreements. Similarly, it is not clear whether principle 9 could serve as a valid basis to claim compensation, in accordance with the Outer Space Treaty and the Liability Convention, for a State which is not a party to those instruments.

The obvious solution here would be for all States to accede to the two agreements. If, however, after adoption of the NPS Principles, a space NPS incident occurs involving one or more non-parties, a possible course of action could be to consider provisions of principle 9 as recommendations to use specific remedies and to follow procedures, envisioned by the Liability Convention, in order to settle the incident.[52] In this connection, it should be mentioned that, if the UN General Assembly adopts the NPS Principles by consensus (and such adoption seems to be practically assured in view of the consensus finalization of the NPS Principles at the COPUOS session in June 1992), they, while non-binding, will have strong political and moral force, and international public opinion will support strict compliance with them.

Conclusions

The Outer Space Treaty and the Liability Convention are fully applicable to damage, as defined in Article I(a) of the Convention, caused by a space object with NPS on board.

While it seems justified to consider elements of the environment under State jurisdiction as property in the meaning of Article I(a) of the Liability Convention, the only attempt at practical application of that Convention to an NPS incident (the COSMOS-954 case) does not support such interpretation. The COSMOS-954 incident was not settled on the basis of that instrument, it was an ex gratia settlement.

Principle 9, "Liability and compensation", of the NPS Principles confirms the applicability of the existing liability regime of outer space law to the use of NPS on board space objects. This principle does not regard the mere scattering of radioactive debris from a space object with NPS on a foreign territory as damage in the meaning of Article I(a) of the Liability Convention. However, the principle recommends reimbursement of duly substantiated expenses for search, recovery and clean-up operations, and, although non-binding, is a useful addition to the regime established by the Outer Space Treaty and the Liability Convention.

Notes

1. UN General Assembly resolution 1962(XVII) "Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space", adopted on 13 December 1963.

2. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 27 January 1967, 18 U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S. 205 (entered into force: 10 October 1967).

3. Convention on International Liability for Damage Caused by Space Objects, 29 March 1972, 24 U.S.T. 2389, T.I.A.S. 7762, 961 U.N.T.S. 187 (entered into force: 1 September 1972).

4. UN doc. A/46/20 of 7 October 1991, paragraph 104.

5. UN doc. A/47/20 of 20 August 1992, paragraphs 109 and 110, and Annex I.

6. See, for example, B. Cheng "Convention on International Liability for Damage Caused by Space Objects" in N. Jasentuliyana and R.S.K. Lee (editors) "Manual on Space Law", Volume 1, New York: Oceana Publications, 1979, pp. 83-172; C.Q. Christol "International Liability for Damage Caused by Space Objects", American Journal of International Law, Volume 74, No. 2, April 1980, pp. 346-371; W.F. Foster "The Convention on International Liability for Damage Caused by Space Objects", The Canadian Yearbook of International Law, Volume X, 1972, pp.137-185; A.A. Roubanov "Mezhdunarodnaya kosmichesko-pravovaya imushestvennaya otvetstvennost" (International Space Legal Liability), Moscow, 1977 (In Russian). A number of interesting ideas on the subject have been offered more recently by F.G. von der Dunk in "Liability Versus Responsibility in Space Law: Misconception or Misconstruction?", Proc. of 34th Colloquium on the Law of Outer Space, Montreal, 1992, pp.363-371.

7. In 1969, UK made a proposal (UN doc. A/AC.105/C.2/L.68, reproduced in UN doc. A/AC.105/58 of 4 July 1969, Annex II, page 36) that "nuclear damage should not be excluded from the forms of damage covered by the Convention". No formal decision was taken by drafters on that matter. The records, however, strongly suggest that some kind of informal understanding had indeed been reached. The last statement on the record on the subject is that of the delegate of Argentina who said on 29 June 1971 that earlier in its work the Legal Subcommittee of COPUOS decided that the Convention "should not extend to nuclear damage. In the opinion of the Argentine delegation, that had been a mistake, which fortunately had been corrected" (emphasis added - A.T.)(UN doc. A/AC.105/C.2/SR.167). It should also be mentioned in this regard that "International Space Law" (Progress Publishers, Moscow, 1976), edited by Professor A.S. Piradov, who was the chief Soviet negotiator of the Convention, explicitly states that the Liability Convention "covers all kinds of damage, including nuclear damage" (p.168).

8. See, for example, statements at the 94th meeting of the Legal Subcommittee of COPUOS (UN doc. A/AC.105/C.2/SR.94).

9. N. Jasentuliyana "Multilateral Negotiations on the Use of Nuclear Power Sources in Outer Space", McGill Annals of Air and Space Law, Volume XIV, 1989, p.307.

10. See "International Conventions on Civil Liability for Nuclear Damage", Legal Series No.4, Revised 1976 Edition, International Atomic Energy Agency, Vienna, 1976.

11. UN doc. A/AC.105/INF.368 of 22 November 1977.

12. Academician L.I. Sedov's interview with TASS correspondent, Izvestia, 14 February 1978. In that interview Soviet scientist Sedov stated that the specific reasons for the satellite malfunction were not known, but in view of the rapidness of depressurization it may be assumed that the satellite collided with some other object of natural or artificial origin.

13. For the history of space nuclear power, see S. Aftergood "Towards a Ban on Nuclear Power in Earth Orbit", Space Policy, February 1989, pp.25-40.

14. The text of the claim was published in 18 I.L.M. 899-930 (1979).

15. Id., p.905.

16. Id.

17. Id., p.907.

18. Id. It should be mentioned in this regard that "intrusion" per se was not a violation of sovereignty. On this problem, see A.D. Terekhov "Passage of Space Objects through Foreign Airspace", Proc. of 32nd Colloquium on the Law of Outer Space, Torremolinos-Malaga, 1990, pp.50-55.

19. Id.

20. The text of the Protocol was published in 20 I.L.M. 689 (1981).

21. P.P.C. Haanappel "Some Observations on the Crash of COSMOS-954", 6J. Space L., 148-149 (1978).

22. S. Gorove "COSMOS-954: Issues of Law and Policy", 6J. Space L., 141-142 (1978).

23. S. Gorove "Environmental Risks Arising from Space Activities: Focus on the Liability Convention", in "Environmental Aspects of Activities in Outer Space: State of the Law and Measures of Protection", Proceedings of International Colloquium, Cologne, May 16-19, 1988, Edited by K.-H. Böckstiegel, 1990 [hereinafter Cologne Colloquium], p.127.

24. N. Jasentuliyana "A Perspective of the Use of Nuclear Power Sources in Outer Space", Annals of Air and Space Law, Volume IV, 1979, pp.545-546.

25. He Qizhi "On Strengthening International Measures for Protection of Space Environment", in Cologne Colloquium, p.247.

26. B. Schwartz and M.L. Berlin "After the Fall: An Analysis of Canadian Legal Claims for Damage Caused by COSMOS-954", McGill Law Journal, Volume 27, 1982, pp.716-717.

27. E. Galloway "The Present Status of the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies", in Cologne Colloquium, p.85.

28. G. Gal "Treaty Law Problems of Space Environmental Protection: De lege ferenda Tasks for International Legislation", in Cologne Colloquium, p.291.

29. N.M. Matte "Environmental Implications and Responsibilities in the Use of Outer Space", McGill Annals of Air and Space Law, Volume XIV, 1988, p.435.

30. S. Courteix "The Legal Regime of Nuclear Power Satellites: A Problem at the Cross-Roads of Nuclear Law and Space Law", Proc. of 34th Colloquium on the Law of Outer Space, Montreal, 1992, p.121.

31. H.A. Baker "Space Debris: Legal and Policy Implications", Martinus Nijhoff Publishers, 1989, p.66.

32. B.A. Hurwitz "Reflections on the COSMOS-954 incident", Proc. of 32nd Colloquium on the Law of Outer Space, Torremolinos-Malaga, 1990, p.351.

33. See, for example, M. Rothblatt "Legal Rights to Dispose of Hazardous Waste in Outer Space", Proc. of 33rd Colloquium on the Law of Outer Space, Dresden, 1991, p.167.

34. See E.G. Lee and D.W.Sproule "Liability for Damage Caused by Space Debris: The COSMOS-954 Claim", The Canadian Yearbook of International Law, Volume XXVI, 1988, pp.273-279. Both co-authors of the article were officials of the Canadian Department of External Affairs at the time of publication, the former being Legal Advisor and Assistant Deputy Minister. Indication of their official positions in the article and the absence of a disclaimer suggest that the views contained in the publication were expressed in the authors' official capacity.

35. Id., p.278.

36. Supra note 4.

37. UN doc. A/AC.105/C.2/L.154/Rev.9 of 12 April 1991. Germany was the second co-sponsor of the paper.

38. Supra note 22.

39. Supra note 25.

40. G.M. Danilenko "Space Activities and Customary Law of Environmental Protection", in Cologne Colloquium, pp.176-177.

41. Id., p.177. See also H.A. Wassenberg "Principles of Outer Space Law in Hindsight", Martinus Nijhoff Publishers, 1991, p.68.

42. See UN doc. A/AC.105/216 of 6 March 1978, paragraphs 128-142.

43. See, for example, M. Benko, W. de Graaff and G.C.M. Reijnen "Space Law in the United Nations", Martinus Nijhoff Publishers, 1985, pp.49-92.

44. N. Jasentuliyana "Multilateral Negotiations on the Use of Nuclear Power Sources in Outer Space", Annals of Air and Space Law, Volume XIX, 1989, pp.297-337.

45. V. Kopal "The Use of Nuclear Power Sources in Outer Space: A New Set of United Nations Principles?", Proc. of 34th Colloquium on the Law of Outer Space, Montreal, 1992, pp.124-131.

46. Supra note 4.

47. Supra note 26, at 705-712. On this subject S. Gorove stated that "it is doubtful that the Outer Space Treaty could be regarded as imposing more liability than the Liability Convention"(supra note 22, at 142). Yet in the same article he added that "it may also be argued that since the Outer Space Treaty contains no definition of damage, the latter could be interpreted to include costs incurred in connection with precautionary measures against potential hazards"(id., p.143).

48. Supra note 26, at 708.

49. For example, the words "For the purpose of this principle" would have been dropped, in which case one might argue that paragraph 3 is just a confirmation of an obligation already established by the Liability Convention.

50. See, for example, Canadian working paper A/AC.105/C.2/L.137 of 28 March 1983, section E.2 of which stipulated that "in accordance with the 1972 Convention on International Liability for Damage Caused by Space Objects..." the launching State should "pay compensation for all damage caused by the nuclear power source, including all reasonable expenses for search and clean-up, and damages related to measures taken to prevent and limit radiation exposure and related to the number of the people exposed and the degree of exposure".

51. B. Cheng. Op. cit. Supra note 6, at 127.

52. On a similar question with regard to principle 8 "Responsibility", see A.D. Terekhov "International Responsibility for Using Nuclear Power Sources in Outer Space - Reflections on the Text Adopted by COPUOS", Proc. of 34th Colloquium on the Law of Outer Space, Montreal, 1992, pp.147-149.