THE USE OF NUCLEAR POWER SOURCES IN OUTER SPACE: A NEW SET OF UNITED NATIONS PRINCIPLES?

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Introduction

During the last decade, the use of nuclear power sources in outer space became one of the most discussed topics on the agendas of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and both of its subcommittees. The consideration of this topic has advanced in recent years and is now approaching its end in the form of a new set of principles addressed to States and international organizations launching objects with nuclear power sources (NPS) on board into outer space. This article deals with the progressive emergence of these principles in the joint efforts of COPUOS and its subcommittees.

The deliberations on NPS developed in two stages, the dividing line being 1986 when the Legal Subcommittee started a systematic elaboration of draft principles on this subject. Nevertheless, the most significant result was recorded in 1990 when an agreement on the principle including "Guidelines and criteria for safe use" was reached. Another important step was made in 1991 when COPUOS reached consensus on "Responsibility" and "Liability and Compensation." In connection with them, the ensuing article will also outline some questions relating to the concepts of responsibility and liability in the wider context of the development of present international law.

In the last section of the article, attention will be drawn to a number of issues concerning the draft principles which are still under discussion. In particular, the problem of defining the term "launching State" for the purpose of these principles, as well as the question of what legal form the new set of principles should take, will be discussed.

It is likely that "Principles relating to the use of NPS in outer space" will be finalized soon and, thus, become a new contribution to the progressive development of international space law by the United Nations.

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The First Stage of Deliberations on NPS

Initiated by Canada in 1978 following the accident of the Soviet nuclear powered satellite Cosmos 954, the use of NPS in space was first raised in the Scientific and Technical Subcommittee. As a follow up in 1979, the Subcommittee established, in accordance with General Assembly resolution 33/16 of 10 November 1978, a working group of experts to consider the technical aspects and safety measures relating to the use of nuclear power sources in outer space.[1] This group, which was open to all members of the Subcommittee, met three times during the sessions of the Subcommittee from 1979 to 1981, and again in 1984 and 1985. After a certain break, when the item of NPS was considered only in the Subcommittee, the working group was reconvened in 1988 and has continued its deliberations in 1989 and 1990, producing valuable reports reflecting the progress reached in its discussions.[2]

Among the conclusions reached in the early stages of the deliberations of the working group, two key elements have served as cornerstones for further work not only in this particular group of experts but in all considerations of this issue within the purview of COPUOS.

The first basic element was laid down in the first report in 1979 and repeated in the 1981 report, which summarized the outcome of the considerations of the working group during the first period of its activities, in the following terms: "Nuclear power sources can be used safely in outer space provided that all necessary safety requirements are met."[3] The safety requirements were then elaborated by the working group in greater detail in its third report.

The second basic element implemented the request of the General Assembly, spelled out in resolution 33/16, calling on launching States to inform other States concerned in case a space object with a nuclear power source on board malfunctions and thereby creates a risk of reentry of radio-active materials to the earth. While the idea of the earliest possible notification of reentry of such an object emerged already at the first session of the working group of the Scientific and Technical Subcommittee, the format of notification was worked out and agreed upon at its third session in 1981.[4] These first results established a basis not only for the further work of this working group, but also for the work of the Legal Subcommittee of COPUOS on the subject of NPS.

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1 *Cf.* Report of COPUOS, 34 U.N. GAOR Supp. (No. 20), para. 44, at 9.

2 Up to now, eight reports have been published by the working group which are reproduced in Annexes to the Reports of the Scientific and Technical Subcommittee from its above-mentioned sessions.

3 *Cf.* U.N. Doc. A/AC.105/287, Annex II, para. 38, at 9.

4 *Id.*, para. 19, at 4-5.

Notwithstanding the fact that the attention of the Legal Subcommittee to NPS was also drawn for the first time in 1978,[5] the decision on the inclusion of an agenda item entitled "Review of existing international law relevant to outer space activities with a view to determining the appropriateness of supplementing such law with provisions relating to the use of nuclear power sources in outer space," was not made until 1980.[6] But still in the same year, the General Assembly decided, in its resolution 35/14 of 13 November 1980, to change the title of the agenda item of the Legal Subcommittee to "consideration of the possibility of supplementing the norms of international law relevant to the use of nuclear power sources in outer space," and to establish a working group on the item.

In 1981, due to disagreement about the necessity of establishing new norms on the subject, discussions in the new working group of the Legal Subcommittee remained without any practical results. In 1982, however, the working group began substantive discussions on the theme of assistance to States affected by accidental re-entry of a space object with an NPS on board.[7] The first results were achieved in 1983 when the working group of the Legal Subcommittee translated *the format of notification*, which had been worked out in the working group of the Scientific and Technical Subcommittee, into an agreed legal text. The principle that "any State launching a space object with nuclear power sources on board should timely inform States concerned in the event this space object is malfunctioning with a risk of reentry of radio-active materials to the earth" was included in this text. This principle was followed by two paragraphs specifying information to be provided. The first paragraph was partly identical with the information required by Article IV of the 1975 Convention on Registration of Objects Launched into Outer Space,[8] with the addition of "information required for best

5 The issue was raised in a working paper submitted by 15 countries which recommended: "In order to ensure the highest degree of safety of human life and the protection of the environment of the earth and of outer space from harmful contamination, the Legal Subcommittee should, in close co-operation with the Scientific and Technical Subcommittee, review existing international instruments, with the objective of recommending any necessary additional legal measures, including possibly a further convention or legal instrument, concerning the use of nuclear power sources in outer space." *Cf.* U.N. Doc. A/AC.105/218, Annex IV, at 1 (1978).

6 The decision was made on the basis of a consensus reached at COPUOS in 1979. *Cf.* Report of COPUOS, 34 GAOR Supp. (No. 20), para. 51, at 10.

7 *Cf.* U.N. Doc. A/AC.105/305, Annex II, at 1*ff.* (1982).

8 Convention on Registration of Objects Launched into Outer Space, *opened for signature* Jan. 14, 1975, 28 U.S.T. 695, T.I.A.S. No. 8480, 1023 U.N.T.S. 15 (*entered into force for the United States* Sept. 15, 1976) [hereinafter "Registration Convention"].

prediction of orbit lifetime, trajectory and impact region." The second paragraph of the agreed text requested "information on the radiological risk of nuclear power source(s)," namely the type of NPS (radio-isotopic/reactor) and the probable physical form, amount and general radiological characteristics of the fuel and contaminated and/or activated components likely to reach the ground. This information was also to be transmitted to the Secretary-General of the United Nations.[9]

Elaboration of the Draft Principles Relevant to the Use of Nuclear Power Sources in Outer Space

In 1986, the Legal Subcommittee renamed the agenda item concerning NPS, which has since been called "Elaboration of draft principles relevant to the use of nuclear power sources in outer space." On the initiative of the working group, this was recommended by COPUOS and endorsed by the General Assembly in it's resolution 40/162 of 16 December 1985. Under this new title, Canada submitted, on 25 March 1986, the first comprehensive draft, which included principles on Safety assessments and notification, Guidelines and criteria for safe use, Notification of re-entry, Assistance to States, and Responsibility and Liability of States.[10]

The Subcommittee, acting through its working group, continued the discussions on *the format of notification* and expanded the original text agreed in 1983 by two additional paragraphs. In these new provisions, the launching State was requested to provide the information "as soon as the malfunction has become known," to update it as frequently as practicable and to increase the frequency of dissemination of the updated information "as the anticipated time of re-entry into the dense layer of the Earth's atmosphere approaches so that the international community would be informed of the situation and would have sufficient time to plan for any

9 *Cf.* U.N. Doc. A/AC.105/320, Annex II, para. 6, at 22-23 (1983). For more detailed analyses of the deliberations in COPUOS and its two Subcommittees on the subject of NPS during the first half of the 1980s, see M. BENKÖ, W. DE GRAAF AND G. C. M. REIJNEN, SPACE LAW IN THE UNITED NATIONS, at 49*ff.* (1985); He, *Towards a New Legal Regime for the Use of Nuclear Power Sources in Outer Space*, 14 J. SPACE L. 95*ff.* (1986), and Jasentuliyana, *Multilateral Negotiations on the Use of Nuclear Power Sources in Outer Space*, 14 ANNALS AIR & SPACE L. 297*ff.* (1987). *See also* the papers of Cocca, Espada, Haanappel and Terekhov in 27 PROC. COLLOQ. L. OUTER SPACE 202*ff.* (1985).

10 *Cf.* U.N. Doc. A/AC.105/C.2/L.154 (1986). This draft was later revised, on the basis of progress made in the working group, in ten succeeding revisions. Starting from the seventh revision of this draft, the Federal Republic of Germany has been its co-sponsor. The most recent version of this document was submitted, but not discussed, during the 1991 session of COPUOS in Graz (Austria). *Cf.* U.N. Doc. A/AC.105/C.2/L.154/Rev.10 (1991).

national response activities deemed necessary." This updated information was also to be transmitted to the UN Secretary-General with the same frequency.[11] Thus the first principle relevant to the use of nuclear power sources in outer space was completed.

Simultaneously, the discussions on the theme of *assistance to States* continued. They concentrated mostly on the question, to whom should the request for assistance be addressed and in what order should it be done. The agreed principle, as adopted by the working group of the Legal Subcommittee in 1986, together with the principle relating to the theme of notification, spelled out first the duty of all States possessing space monitoring and tracking facilities, "to communicate the relevant information that they may have available on the malfunctioning space object with a nuclear power source on board to the Secretary-General of the United Nations and the State concerned as promptly as possible to allow States that might be affected to assess the situation and take any precautionary measures deemed necessary." This should be done upon notification of an expected re-entry into the Earth's atmosphere of a space object containing nuclear power source on board and its components, *i.e.* before this re-entry occured. After the re-entry into the Earth's atmosphere of such an object, "the launching State shall promptly offer, and if requested by the affected State, provide promptly the necessary assistance to eliminate actual and possible harmful effects;" and "all States, other than the launching State, with relevant technical capabilities and international organization with such technical capabilities shall, to the extent possible, provide necessary assistance upon request by an affected State." Thus the agreed principle laid the assistance of both the launching and the other States on the same footing, leaving the affected States the right to choose the addressee for its request. However, in providing assistance in any of these ways, the special needs of developing countries should be taken into account.[12]

In the following years, the working group of the Legal Subcommittee has succeeded in enlarging the agreed texts by further principles. Though some of these texts were dealing with less difficult problems and were couched in more general terms, the consensus recorded on these texts was evidence of a new spirit which started in the latter part of the 1980s, not

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11 *Cf.* U.N. Doc. A/AC.105/370, Annex II, subparas. 5.2 and 5.3, at 16-17 (1986). This additional part of the text on notification of re-entry was agreed upon on the basis of two working papers submitted by the Federal Republic of Germany in 1983 and 1984 (U.N. Doc. A/AC.105/C.2/L.138 (1983) and U.N. Doc. A/AC.105/C.2/L.146 (1984). They reflected the experience with the unplanned re-entry of Cosmos 1402 in January 1983 when the Secretary-General was informed by the USSR, through a series of additional notifications, of the separation, descent and burning up of component parts of this malfunctioning space object.

12 *Cf.* U.N. Doc. A/AC.105/370, Annex II, subparas. 5.4 and 5.5, at 17-18 (1986).

only in COPUOS and its subsidiary bodies, but in international relations in general. The effect of the catastrophe in Chernobyl also played an important role in changing attitudes towards the risks arising from malfunctioning space objects with nuclear power sources on board re-entering the earth or remaining in space. After Chernobyl, two new conventions dealing with nuclear problems were quickly elaborated under the auspices of the International Atomic Energy Agency and adopted on 26 September 1986, namely the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident of Radiological Emergency.[13] Both instruments entered into force soon thereafter.

In the working group of the Legal Subcommittee, a principle relating to the theme of *applicability of international law*, including in particular the UN Charter and the 1967 Outer Space Treaty,[14] to activities involving the use of nuclear power sources in outer space, was agreed upon in 1988.[15] The following year, the working group recorded consensus on principles relating to the themes of *consultations* and *settlement of disputes*. While the former would bind States providing information "to respond promptly to requests for further information or consultations sought by other States," the latter would obligate States to resolve any dispute resulting from the application of the principles by peaceful means, in accordance with the Charter of the United Nations, leaving to parties to the dispute to choose between negotiations and other established procedures for the peaceful settlement of disputes.[16]

At the same time, discussions continued on the "hard core" issues that still remained unresolved. These discussions, sometimes rather repetitive, are duly reflected in the reports of the chairman of the working group on this agenda item, which grew in length, particularly during the period since 1987. They offer an adequate picture of the complexity of the issues under consideration.[17]

Apparently the most significant step forward was recorded in 1990 due to close cooperation of the two Subcommittees of COPUOS. During the

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13 *Cf.* the texts of both of these conventions in IAEA Gen. Conf. Doc. GC(SPL.I) 12 (1986).

14 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205 *(entered into force for the United States Oct. 10, 1967)* [hereinafter "Outer Space Treaty"].

15 *Cf.* U.N. Doc. A/AC.105/411, Annex I, paras. 8 and 9, at 17 (1988).

16 *Cf.* U.N. Doc. A/AC.105/430, Annex I, para. 42, at 24 and para. 53, at 26 (1989).

17 *Cf.* U.N. Doc. A/AC.105/385, Annex I, at 14-22 (1987); U.N. Doc. A/AC.105/411, Annex I, at 16-27 (1988); U.N. Doc. A/AC.105/430, Annex I, at 16-27 (1989); U.N. Doc. A/AC.105/457 and Corr. 1, Annex I, at 16-23 (1990); and U. N. Doc. A/AC.105/484, Annex I, at 13-20 (1991).

eighth session of the working group of the Scientific and Technical Subcommittee, an agreement was reached on a set of recommendations for the safe use of nuclear power sources in outer space.[18] A joint working paper prepared by Canada, France and the Federal Republic of Germany[19] in the working group of the Legal Subcommittee translated these recommendations into legal language and served as a basis for a thorough consideration of this subject from the legal point of view under the heading of *guidelines and criteria for safe use*. At the 1990 session of the Subcommittee, the working group concentrated on this question and recorded consensus on the text of this principle, which is now listed as principle 3 and represents the most extensive - and also the most complicated - part of all the principles so far elaborated.

The text of this principle[20] begins with an important general statement according to which "the use of nuclear power sources (NPS) in outer space shall be restricted to those space missions which cannot be operated by non-nuclear energy sources in a reasonable way." The aim of this general policy is the effort at minimizing the quantity of radio-active material in space and the risks involved.

The agreed text then establishes general goals for radiation protection and nuclear safety, in particular the duty of States launching space objects with NPS on board to endeavor "to protect individuals, populations and the biosphere against radiological hazards." This is a characteristic goal of the new document, differentiating it, for example, from the goals of the 1972 Liability Convention, which defined the term "damage" as loss of life, personal injury or other impairment of health, or loss of or damage to property of States or of persons, natural and juridical or property of international intergovernmental organizations. For these kinds of damage the prompt payment of a full and equitable measure of compensation to victims of such damage should have been ensured under the terms of the Liability Convention. Here, however, in addition to individuals and populations, "the biosphere," *i.e.* the environment in which life had been developed, should also be protected. It is to be noted that the biosphere is not limited to areas under the jurisdiction of States but also includes areas beyond the national jurisdiction of States ("the global commons").

During the normal operation of space objects with NPS on board, including re-entry from a sufficiently high orbit (SHO), the appropriate radiation protection objective for the public recommended by the International Commission on Radiological Protection (ICRP) shall be observed. Systems important for safety shall be designed, constructed and operated in accordance with the general concept of defense-in-depth. Pursuant to this concept, forseeable safety-related failures or

18 *Cf.* U.N. Doc. A/AC.105/456, 1990, Annex III. para. 15, at 34-37 (1990).

19 *Cf.* U.N. Doc. A/AC.105/C.2/L.177 (1990).

20 *Cf.* U.N. Doc. A/AC.105/457, para. 12, at 18-20 (1990).

malfunctions must be capable of being corrected or counteracted by an action or a possibly automatic procedure.

Principle 3 then proceeds with specific rules, first concerning nuclear reactors. They may be operated on interplanetary missions, in sufficiently high orbits (SHO), which are defined as those "at which the orbital lifetime is long enough to allow for a sufficient decay of the fission products to approximately the activity of the actinides," and in low Earth orbits if they are stored in SHO after the operational part of their mission. It is interesting to note that the general definition of SHO is completed by two specific criteria: the SHO must be such that the risks to existing and future outer space missions and of collisions with other space objects are kept to a minimum, and the necessity for the parts of a destroyed reactor also to attain the required decay time before re-entering the Earth's atmosphere shall be considered in determining the SHO altitude.

In a similar way, specific rules for the use of radio-isotopic generators are established. This kind of fuel may be used for interplanetary missions and other missions leaving the gravity field of the Earth, and also in Earth orbit if, after conclusion of the operational part of their mission, they are stored in a high orbit. Radio-isotope generators shall be protected by a containment system that is designed and constructed to withstand the heat and aerodynamic forces of re-entry in the upper atmosphere under forseeable orbital conditions, including highly elliptical or hyperbolic orbits where relevant. Upon impact, the containment system and the physical form of the isotope shall ensure that no radio-active material is scattered into the environment so that the impact area can be completely cleared of radio-activity by a recovery operation.

These are but the highlights of the text of principle 3 dealing with guidelines and criteria for safe use which is, as already mentioned, fairly complex and loaded with technical terms.

At its meeting in 1990, the working group of the Legal Subcommittee also considered the remaining principles on which agreement was not yet reached. Notwithstanding the exchange of views which brought some new elements, no other consensus could be recorded during the 1990 session of the Legal Subcommittee.

During the session of COPUOS, which was held in June 1990 and considered, *inter alia*, the report of the Legal Subcommittee on the work of its twenty-ninth session, some further progress was made in an informal meeting and in consultations among interested delegations. They reached

"a basis for consensus in the near future" on a text for draft principle 8 dealing with responsibility.[21]

Moreover, the delegation of Canada and the Federal Republic of Germany submitted a revised version of the working paper originally prepared by Canada, in order to facilitate the discussions on the document at the 1991 session of the Legal Subcommittee.[22]

The progress achieved at the 1990 session of the Legal Subcommittee was generally considered as a breakthrough which removed what had been regarded as the main stumbling block on the way to the final goal. The optimists even predicted that due to this advanced stage of negotiations, the NPS principles might be finalized at the 1991 session of the Legal Subcommittee so that COPUOS, which was invited by the government of Austria to hold its 1991 session in Graz, could endorse the full set of principles and recommend it for adoption to the General Assembly. However, the situation developed in a way different from what was expected.

At the Twenty-eighth session of the Scientific and Technical Subcommittee, which was held in New York from 19 February to 1 March 1991, the United States submitted a working paper which revisited certain portions of the Subcommittee's recommendations underlying draft principle 3. A number of specific modifications were required in this document "to ensure the technical accuracy of the recommendations, as a step towards contributing further to the substantial progress made in the Subcommittee on this subject."[23]

A similar document was then submitted by the United States delegation to the thirtieth session of the Legal Subcommittee held in New York from 25 March to 12 April 1991.[24] Some of the improvements

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21 *Cf.* Report of COPUOS, 45 GAOR Supp. (No. 20), para. 104, at 17. - In these informal discussions, it was also concluded that the text of draft principle 11 dealing with relations with international treaties and agreements, which would confirm that "application of these principles shall not prejudice the rights and obligations of States and international organizations under international treaties and agreements," could be deleted. This was then in fact decided at the 1991 session of the Legal Subcommittee. (*Cf.* U.N. Doc. A/AC.105/484, Annex I, para. 25, at 20 (1991).

22 *Cf.* U.N. Doc. A/AC.105/C.2/L.154/Rev. 7 in Report of COPUOS, 45 GAOR Supp. (No. 20), Annex II, at 36-38.

23 *Cf.* U.N. Doc. A/AC.105/C.1/L.176 (1991) and Report of the Scientific and Technical Subcommittee on the Work of its Twenty-eigth session, U.N. Doc. A/AC.105/483, para. 58, at 14 (1991). The U.S. working paper was later reissued as COPUOS Doc. A/AC.105/485 (1991).

24 *Cf.* U.N. Doc. A/AC.105/C.2/L.185 (1991). The text of this document consists of two parts: the first one is explanatory, the second one (Annex) provides the proposed U.S. changes as they would appear in the text adopted by the Legal Subcommittee in 1990.

suggested in this document have been of a rather detailed or drafting character. Some others, however, have been of substantive nature. Thus, for instance, it has been proposed to delete the general statement of policy, in the beginning of principle 3, according to which the use of NPS in outer space should be restricted to those space missions which cannot be operated by non-nuclear energy sources in a reasonable way. Furthermore, the requirements to restrict radiation exposure have not been laid down in the new U.S. text in exact doses but only in general terms. Similarly, the above-mentioned concept of defense-in-depth has been redrafted. Finally, the requirements concerning a containment system for the nuclear fuel in radio-isotope generators have also been modified, particularly by substituting the need for localization of the radioactive material scattered into the environment, so that the impact area can be cleared of radio-activity by a recovery operation, for the absolute duty, which was spelled out in the text agreed in 1990, to ensure that no radio-active material is scattered into the environment.

Since other members of the Legal Subcommittee were not inclined to reopen the discussion of principle 3 and the U.S. delegation did not insist on an immediate attempt at redrafting the agreed text of this principle, the Subcommittee turned to the remaining themes on which agreement had not been reached.[25]

Therefore, most of the attention of the Legal Subcommittee and its working group at the 1991 session was devoted to draft principles 8 and 9 dealing with responsibility and compensation. A new impetus to the discussions on these subjects was given by a working paper submitted jointly by the delegations of Canada, China, Czechoslovakia, France, Germany, Italy, the Nehterlands, Sweden and the United Kingdom.[26] This document, together with an earlier version of those draft principles contained in the working paper submitted by the delegations of Canada and

25 On the other hand, a certain step forward relating to the theme of principle 3 was done at the 1991 session of the Legal Subcommittee with regard to the question of the proper location of a provision reflecting the content of former paragraph 1.5 of draft principle 3, which was originally contained in the text agreed in the working group of the Scientific and Technical Subcommittee, and was deleted from the text of draft principle 3 adopted by consensus at the 1990 session of the Legal Subcommittee. It was proposed that this text might be included in para. 2(a) of principle 7 dealing with assistance. The working group of the Legal Subcommittee "believed that a consensus could be reached in the near future" on an additional sentence according to which the assistance provided under principle 7 should include "assistance to identify the location of the area of impact of the nuclear power sources on the Earth's surface, to detect the re-entered material and to carry out retrieval or clean-up operations." (*Cf.* U.N. Doc. A/AC.105/484, Annex I, para. 13, at 16-17 (1991).

26 *Cf.* U.N. Doc. A/AC.105/C.2/L.184 (1991)..

the Federal Republic of Germany,[27] served as the basis of a thorough consideration of the relevant issues in the working group.[28]

Notwithstanding the fact that these discussions opened the way to a rapproachment on several aspects, consensus on the final wording of principles 8 and 9 could not be recorded at the Legal Subcommittee. However, this goal was reached during the 1991 session of COPUOS in Graz where informal consultations on these draft principles continued. Due to the efforts of the delegations of Canada and Germany, and the understanding and support of the other delegations, the Committee recorded consensus on these principles which is enshrined in its report from this session.[29]

The agreed text of principle 8 dealing with *responsibility* is parallel to that of Article VI of the 1967 Outer Space Treaty. Moreover, it spells out *expressis verbis* that the national space activities for which States shall bear international responsibilitiy include the use of NPS in outer space. States shall also bear this responsibility for assuring that these activities are carried out in conformity with that treaty "and the recommendations contained in these principles." When activities in outer space involving the use of NPS are carried out by an international organization, responsibility for compliance with the Outer Space Treaty and "the recommendations contained in these principles" shall be borne both by the international organization and by the States participating in it.

In a similar way, the agreed text of principle 9 dealing with *liability and compensation* is closely linked with the existing principle laid down in article VII of the 1967 Outer Space Treaty and the respective provisions of the 1972 Liability Convention.[30] Thus, the text declares that the principle, according to which 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, "fully applies to the case of such a space object carrying a nuclear power source on board." Also in the case, 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 Liability Convention.

In the second paragraph, the adopted text remains very close to the Liability Convention saying that "the compensation that such States shall be liable to pay under the aforesaid Convention for damage shall be determined in accordance with international law and the principles of

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27 *Cf.* U.N. Doc. A/AC.105/C.2/L.154/Rev.7 (1990).

28 This consideration is adequately reflected in the Report of the Legal Subcommittee on the Work of its Thirtieth session (25 March - 12 April 1991). *See* U.N. Doc. A/AC.105/484, Annex I, paras. 14-24, at 17-20 (1991).

29 *Cf.* U.N. Doc. A/AC.105/L.192.Add.3/Corr.1 (1991).

30 Convention on International Liability for Damage Caused by Space Objects, March 29, 1972 24 U.S.T. 2389, T.I.A.S. No. 7762; 961 U.N.T.S. 187 (*entered into force for the United States Oct. 9, 1973*) [hereinafter "Liability Convention"].

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." From this wording, it can be concluded that the duty to compensate the damage caused also fully applies to the cases of space objects carrying an NPS on board.

Probably the most significant compromise, however, is included in para. 3 which declares: "For the purposes 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." By this provision the longstanding dispute, whether expenses incurred in recovery and clean-up operations have already been encompassed in the compensation required by the Liability Convention, or not,[31] was settled. For the adherents of the first interpretation, para. 3 of principle 9 will have only a declaratory value, while for the opponents of this interpretation, this provision will establish a new rule. Furthermore, by limiting the duty to compensate the expenses to those which would be "duly substantiated," the issue whether reference should be to all expenses or only to some of them (those qualified as "necessary", "reasonable", "justified" and the like) was overcome.[32]

The final outcome of a lengthy discussion of these principles, notwithstanding the evident features of a compromise solution, seems to be reasonable. It also reflects the up-to-date development of international law in general and international space law in particular. Present international law, as evidenced by the work of the United Nations International Law Commission, differentiates two types of responsibility: State responsibility for wrongful acts violating the rules of international law, and liability for damage caused by certain types of activities which do not technically breach any norm of international law but for which States assume the responsibility on the basis of specific agreements because of the risk involved or harmful effects they cause.[33]

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31 *Cf. e.g.* U.N. Doc. A/AC.105/484, Annex I, para. 22-23, at 19 (1991).

32 *Cf.* U.N. Doc. A/AC.105/385, Annex I, para. 43, at 21-22 (1987) and U.N. Doc. A/AC.105/430, Annex I, para. 52, at 26 (1989). See also the view recorded in U.N. Doc. A/AC.105/457, Annex I, para. 19, at 22-23 (1990).

33 For the latest stage of considerations in the International Law Commission of the topic "International Liability for Injurious Consequences Arising out of Acts not Prohibited by International Law," the purpose of which is to elaborate draft articles including a general regulation of this kind of responsibility, *cf.* Report of the ILC on the Work of its Forty-second session, 1 May - 20 July 1990, 45 GAOR Supp. (No.10), Ch. VII, at 242-285. See also the Seventh Report on international liability for injurious consequences arising out of acts not prohibited by international law by Mr. Julio Barboza, Special Rapporteur, U.N. Doc. A/CN.4/437 (1991).

The 1967 Outer Space Treaty deals both with international responsibility and international liability for damage, and the respective principles are included in two separate provisions, article VI and article VII. However, it is questionable whether responsibility under article VI of the Outer Space Treaty, which was negotiated before the International Law Commission draft articles on State responsibility crystallized, really means responsibility for wrongful acts as conceived in the International Law Commission,[34] or it simply declares the duty of States and international organizations to exercise control over activities in outer space.

As far as liability for damage is concerned, this principle, as enshrined in article VII of the Outer Space Treaty, was later developed in the 1972 Liability Convention, which elaborated in greater detail the concept of damage, and procedures to be used for the presentation and settlement of claims. If the principle on the use of NPS, following the example of the 1967 Outer Space Treaty, should deal with all questions relating to liability in a single principle, this principle must be called "Liability for Damage and Compensation," and not only "Compensation" as was done before, for compensation is just one part of this complex. However, a still more suitable solution might have been the insertion of a general stipulation of liability in a separate principle, for the problem of compensation might arise not only on the basis of liability for injurious consequences of acts not prohibited by international law, but also on the basis of responsibility if this term is understood as responsibility for a wrongful act.[35]

The picture of the principles, which have been elaborated so far, would not be complete without mentioning draft principle 12, which provides for a *revision* of the NPS principles by COPUOS no later than 10 years after their adoption.[36] This text seems to be acceptable for most of the members of the Subcommittee. The only comment expressed at the 1991 session of the Legal Subcommittee in relation to it drew attention to the need for consideration of its wording in the light of all other draft principles when they are finalized.[37]

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34 *Cf.* the text of these articles in: Report of the International Law Commission on the Work of its Twenty-eighth session, 3 May - 23 July 1976, 31 GAOR Supp. (No. 10), at 170*ff.*

35 *Cf.* the views recorded in U.N. Doc. A/AC.105/457, Annex I, para. 19, at 22 (1990). See also U.N. Doc. A/AC.105/385, Annex I, paras. 37-42, at 20-21 (1987).

36 *Cf.* the draft of principle 12 in the working paper of Canada, U.N. Doc. A/AC.105/C.2/L.154/Rev.6 of 17 April 1990.

37 *Cf.* U.N. Doc. A/AC.105/484, para. 26, at 20 (1991).

Questions Relating to the Remaining Themes

In spite of the progress reached, a number of questions to be resolved still remain. First of all, a couple of principles which have been considered together, namely that on *notification of the presence on board a space object of an NPS* (draft principle 2) and that on *safety assessment* (draft principle 4) require further discussion.

One of the questions relating to the theme of *notification* concerns the relationship of the draft principle, which would provide for furnishing to the UN Secretary-General specific information as to the presence on board the space object of an NPS and its generic classification, with article IV of the 1975 Registration Convention, which does not oblige States to furnish information on the presence of an NPS on board a space object, although such information could be voluntarily given. The question arose whether draft principle 2 would not in effect amend the 1975 Registration Convention, which the General Assembly had recently reviewed[38] without recommending any amendment thereto.[39] This question, however, seems to be rather premature, for a draft principle cannot "amend" any established legal rule. Furthermore, it has not been decided yet what legal form will be given to the principles on NPS when they are finalized. Moreover, the general régime established by the Registration Convention cannot prevent States from adopting a special régime governing the notification of the presence of an NPS on board a space object, which would impose upon the parties concerned additional duties with regard to such space objects.

Furthermore, the question of whether this information should be furnished "prior to" or "as soon as possible after the launching" was also discussed several times in the working group in past years.

These issues, however, could be altogether removed if, as suggested by some delegations, draft principle 2 were completely left out because its purposes might be better achieved in practical terms by making publicly available the results of a safety assessment which should be conducted prior to each launch under draft principle 4. On the other hand, there seems to be some merit in the view of those objecting to this deletion on the ground that draft principle 2 and draft principle 4 serve different objectives.[40]

At the 1991 session of the Legal Subcommittee, a new basis for discussing the issue was provided by a working paper submitted jointly by Canada, France, Germany and Sweden.[41] In this proposal the former draft principles 2 and 4 were combined in a single draft principle 4 called "Safety assessment." The new text spells out the duty of a State launching a space object with an NPS on board to conduct a thorough and

38 *Cf.* G.A. Res. 41/66 (Question of the review of the Convention on Registration of Objects Launched into Outer Space) of 3 December 1986.

39 *Cf.* U.N. Doc. A/AC.105/457, Annex I, para. 11, at 17-18 (1990).

40 *Cf.* U.N. Doc. A/AC.105/457, para. 9, at 17 (1990).

41 *Cf.* U.N. Doc. A/AC.105/C.2/L.183 (1991).

comprehensive safety assessment prior to each launch in accordance with the guidelines and criteria for safe use in principle 3. The results of this assessment which should cover all relevant phases of the mission and should deal with all systems involved including, for example, the means of launching the space platform, the nuclear power source and its equipment, and the means of control and communication between ground and space, should be made publicly available prior to each launch through the Secretary-General of the United Nations.

This proposal, however, did not satisfy all members of the Subcommittee. Some of them proposed that the title of principle 4 should read as follows: "Safety assessment and notification of the presence on board a space object of a nuclear power source." Moreover, they suggested to include a new paragraph in the text in which the duty to communicate information as to the presence on board the space object of an NPS to the Secretary-General prior to each launching would be retained and the format of such information would be specified.[42]

Notwithstanding a detailed discussion on this issue, in which several aspects were clarified, it was not possible to reconcile the opposing views either in the working group of the Legal Subcommittee at its 1991 session, or at the COPUOS session during the discussion of the report of the Subcommittee later the same year.

Among the questions relating to the theme of safety assessment there is also a juridically subtle problem of who should perform, and who should be held responsible for, a thorough safety assessment prior to launch as provided in the draft principle 4. At the 1990 meeting of the working group of the Legal Subcommittee, some delegations held the view that the "launching State" would be the subject of this duty, and that this notion includes a State which launches space objects or procures the launching of a space object, as well as a State from whose territory or facility a space object is launched. This would be in accord with the 1972 Liability Convention and the 1975 Registration Convention, which have identical definitions in their articles I. On the other hand, the primary role of the State from whose territory the space object is to be launched, which has to give permission for the launch, was emphasized. Another view held that a safety assessment can be made only by the country which has manufactured, designed or constructed the space object with an NPS on board, particularly when the launching State is not the manufacturing State. A new text reformulating draft principle 4 was also suggested by the French delegation, which stipulated: "States from whose territory space objects with nuclear power sources on board are launched shall conduct, in

42 In the view of those delegations, prior notification of relevant information, which would allow States in the vicinity of launching sites to take precautionary measures, and which is therefore a confidence building measure in international relations, is not identical to the notion of prior safety assessment and both those notions should be clearly embodied in draft principle 4. *Cf.* U.N. Doc. A/AC.105/484, Annex I, para. 5, at 14 (1991).

co-operation, where relevant, with States which have designed or constructed or will operate the nuclear power source, a thorough safety assessment prior to each launch. This assessment shall cover all relevant phases of the mission and shall deal with all systems involved including the means of launching, the space platform, the nuclear power source and its equipment, and the means of control and communication between ground and space."[43]

None of these views prevailed at the 1990 session of the Legal Subcommittee and the discussion of this issue remained without any conclusion. However, the necessity of clarifying all related aspects by a definition of the "launching State" has become evident. A step toward this end was suggested in the seventh revision of the draft principles submitted by Canada and the Federal Republic of Germany at the thirty-third session of the COPUOS in June 1990.[44] This document included first a new draft principle 1A dealing with a general definition of the terms "launching State" or "State launching" which read as follows: "For the purposes of these principles the terms "launching State" or "State launching" are defined as the State on whose registry a space object is carried in accordance with the Convention on Registration of Objects Launched in Outer Space or, if the object is not registered in accordance with that Convention, the State which exercises or plans to exercise jurisdiction and control over such space objects as envisaged in article VIII 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." Moreover, in accordance with this general definition, the duty of furnishing specific information as to the presence on board the space object of an NPS and its generic classification to the Secretary-General (draft principle 2) was *expressis verbis* assigned to "each State of registry" of such a space object. And the duty of performing a thorough safety assessment prior to each

43 *Cf.* U.N. Doc. A/AC.105/457 and Corr. 1, para. 17, at 21 (1990).

44 *Cf.* Report of COPUOS, 45 GAOR Supp. (No. 20), Annex II, at 36*ff.*

launch should be fulfilled by "a State having jurisdiction and control over nuclear power sources on board space object."[45]

At the 1991 session of the Legal Subcommittee, the issue of defining the term "launching State" was touched only marginally, because it was felt that such a definition should be considered thoroughly at a later stage. The problem was mentioned only with regard to draft principle 4, when some members of the Subcommittee maintained that in case of involvement of more than one State in the launching the safety assessment should be carried out by the State launching a space object with a nuclear power source on board as well as by other States which had cooperated in the launching, including those which had designed or manufactured the space object. In this connection, it was also stated that "the State which was in the best position to gather all the technical information on the mission and various systems involved should be responsible for the safety assessment, in order to allow such a safety assessment to be global and exhaustive."[46]

In further revisions of the draft principles submitted by Canada and Germany,[47] their above-mentioned approach was modified by introduction of two different definitions. According to the latest of these

45 It may be interesting to note that a similar position was already held by the United States in the 1960s during the discussions on the definition of "launching State" to be included in the Liability Convention. Commenting on its proposal (A/AC.105/C.2/L.8/Rev.1), the U.S. delegation considered it "preferable to define a "launching State" as a State that has notified the Secretary-General of the United Nations of its launching of a space object and provided the Secretary-General with the identification data necessary for the registration of the space object in the registry maintained at the United Nations."..."It would also cause no difficulty to States participating in a joint launching for they might decide as between themselves on the State which should be the State of registry, and then enter into arrangements as to the apportionment of liability as between them. Provisions to this effect would also give emphasis to the registry of space objects now maintained in the United Nations, and it was important to build up the system of registration." *Cf.* III MANUAL ON SPACE LAW, *Travaux Préparatoires and Related Documents* 295-96 (Comp. N. Jasentuliyana & Roy S.K. Lee 1981). In a later U.S. proposal of the Liability Convention (U.N. Doc. A/AC.105/C.2/L.19 (1967), the term "launching State" was defined in the following way: "Launching State means a Contracting Party, or an international organization that has transmitted a declaration to the Secretary-General under Article V, paragraph 1, of this Convention, that launches or actively and substantially participates in the launching of an object into outer space, or from whose territory or facility an object is launched into outer space, or that exercises control over the orbit or trajectory of such an object." *(Id. a*t 301).

46 *Cf.* U.N. Doc. A/AC.105/484, Annex I, para. 1, at 15-16 (1991).

47 *Cf.* U.N. Doc. A/AC.105/C.2/L.154/Rev.9 and Rev.10 (1991).

revisions, a general definition of "launching State," which would be valid for principles 3,4,5 and 7, would mean the State on whose registry a space object is carried in accordance with the 1975 Registration Convention, and which would retain jurisdiction and control over such an object according to article VIII of the 1967 Outer Space Treaty. Should the object be not registered in accordance with the Registration Convention, this term would mean the State which "exercises jurisdiction and control over such space object." At the same time, for the purpose of principle 9 (liability and compensation), the definition of the term "launching State" as contained in that principle should be applicable.[48]

As has been mentioned above, principle 9, as already adopted by consensus during the 1991 COPUOS session, refers in this respect to article VII of the Outer Space Treaty and to the provisions of the 1972 Liability Convention, thus keeping the definition which has been established in these instruments and which has been retained in article I of the Registration Convention. The main reason, why the definition of "launching State" was formulated in these treaties just in this way, was the intention of its drafters to enable the State damaged by a space object or its component parts, acting also on behalf of its natural and juridical persons, to present the claims at an interstate level and to address them to any of the States mentioned in the definition thus permitting the presenting State to act promptly in accordance with its political interests. The settlement of the legal aspects of a possible participation of other States or legal entities in the given case before and after the launching of the space object concerned was considered as an internal problem of these participants to be governed by their mutual agreements or civil law contracts.[49]

The considerations, which led the drafters of the three treaties to the above conclusions, seem to be equally valid with regard to the NPS principles. The concept of "the country which has manufactured, designed or constructed the space object," if applied to the NPS principle, would raise difficult problems if we take into account the possibility of involvement of several countries and of their private contractors in these

48 *Cf.* U.N. Doc. A/AC.105/C.2/L.154/Rev.10 (1991).

49 Professor Nicholas Mateesco Matte, in a study published already in 1977, drew attention to the difference between the liability of the launching State and the product liability of the manufacturer of a finished product or of a component part, of the producer of a natural product, and of the persons engaged in their supply and distribution, for damages which arise from the use of defective products. He concluded: "The point of reference remains always the launching, procurement of launching or lending of territory or facility for launching. To avoid confusion, reference should therefore not be made to the international liability of the launching state when speaking of products liability in relation to space transportation." *Cf.* Matte, *Product Liability of the Manufacturer of Space Objects*, 2 ANNALS AIR & SPACE L. 378-380 (1977).

activities. Similarly, the concept of a leading role for the State from whose territory the space object is launched might initiate many problems.

After all, it should be borne in mind that these principles would be complementary to and applied together with the respective provisions of the 1967 Outer Space Treaty, the 1972 Liability Convention and the 1975 Registration Convention. In order to avoid any confusion arising from different definitions in different documents applicable to a single case, it is advisable to retain, as much as possible, the uniform meaning of key juridical notions on which all these documents should be based. Moreover, the 1967 Outer Space Treaty, the 1972 Liability Convention and the 1975 Registration Convention will remain the basic and legally binding instruments to be applied by their parties in respect of damage caused by any space object, whether having an NPS on board or not, while the Principles relevant to the use of nuclear power source in outer space should only supplement the provisions of these treaties with regard to the use of NPS by a set of specific recommendations.

Last but not least, the question of *the form of this document* still remains to be decided. It is true that regulations of problems relating to liability for damage, which may have serious financial consequences, are usually included in international conventions as evidenced, *inter alia*, by the 1972 Convention on International Liability for Damage Caused by Space Objects. However, the debates on the principles on NPS in the Legal Subcommittee of the COPUOS and the character of the texts agreed (or expected to be agreed) indicate that very likely, the draft principles relevant to the use of nuclear power sources in outer space will follow the example of the 1986 Principles Relating to Remote Sensing, and will be adopted and declared by the United Nations General Assembly in a resolution to which these principles will be annexed.[50] The present political will of the negotiating States to finalize this document soon also speaks in favor of this alternative, for the transformation of the principles included in the present text into treaty provisions, together with a reconsideration of specific technical rules that are now contained in some of these principles,[51] which would be necessary for the purpose of a

50 As to the legal significance of principles declared by the United Nations General Assembly, *cf.* Kopal, *The Role of United Nations Declarations of Principles in the Progressive Development of Space Law,* 16 J. SPACE L. 17*ff.* (1988).

51 At the 1991 session of COPUOS, the observer for the IAEA drew attention to the revision of the recommendations of the International Commission on Radiological Protection (ICRP) made in 1990 and the establishment of Basic Safety Standards for Radiation Protection which should be reflected in the NPS principles, particularly in principle 3 dealing with guidelines and criteria for the safe use of NPS in outer space. Nonetheless, he made it also clear "that the IAEA believes that it is essential to retain the basis of the catalogue even if its present formulation is not optimal from a technical point of view." *Cf.* text of the IAEA Statement of 4 June 1991 to COPUOS.