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NUCLEAR POWER SOURCES (NPS) FOR SPACE OBJECTS: A NEW CHALLENGE FOR INTERNATIONAL LAW

by

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Dedication

This article is dedicated to the memory of my friend and colleague the late Judge Manfred Lachs. In his wise way he once observed that lawmaking "is a continuous process in which the lawmakers must remain watchful, facing the existing and changing requirements of life."[1]

Abstract

International law is challenged constantly by evolving wants, needs, interests, and values. International space law, as one of the youngest and most dynamic areas of international law, provides a case *par excellence* of exciting challenges and searches for effective responses. The adoption on December 14, 1992 by the U.N. General Assembly of Resolution 47/20 is a case in point.[2]

The 1992 Resolution entitled "Principles Relevant to the Use of Nuclear Power Sources in Outer Space" was designed to mitigate the dangers which might result from the presence of highly enriched uranium 235 used as fuel on space objects. Regulation and control of on-board uses are the central theme of the Resolution.

The Resolution will be analyzed on the basis of its positive, negative, neutral, and uncertain aspects. It is important that its terms receive early critical assessment, since they are subject to revision by COPUOS no later than two years after their adoption. In their final form, and it will be necessary to decide what that form will be, the Principles must advance valued social goals and world security.

Introduction

In general terms international space law has focused on the exploration, use, and exploitation of outer space, per se, and of the Moon and other celestial bodies. Activities have been emphasized. Space law has also focused on the place where

such activities have taken place. Such activities begin on Earth, occur in air space, and reach fruition in outer space, on the Moon and other celestial bodies.

There is a general awareness of he dangers presented by the presence of nuclear energy. Special attention must be accorded to those areas where nuclear accidents would produce the largest harms, namely on Earth. Earth-based persons and property would experience substantial harms.

In any fundamental statement of rights and duties relating to the use of nuclear power sources (NPS) suitable attention must be given to the roles of launching States and other launching entities as well as the rights and duties of those States or other entities which may have been a participant in the procuring of launches.

The 1992 Principles are the product of discussions initiated in COPUOS in 1978. This was the year when *Cosmos 954*, equipped with a NPS of enriched uranium 235 fuel, made an unprogrammed reentry into Canada.

The Principles constitute a major achievement in many ways, not the least of which are the detailed technical provisions contained in Principle 3 "Guidelines and Criteria for Safe Use." The noteworthy cooperation between scientists and lawyers led to a balanced, if not perfect, result. That there are areas in the Principles which require further study was reflected in Principle 11 "Review and Revision." There it was stipulated that "These Principles shall be reopened for revision by the Committee on the Peaceful Uses of Outer Space no later than two years after their adoption."

An appraisal of the merits of the Principles, from a perspective of law and policy, can be divided into four parts. There are positive aspects, negative aspects, neutral aspects, and uncertain aspects.

Positive Aspects of the 1992 Principles

Undoubtedly the positive provisions of the Principles outweigh provisions not appraised so favorably. As noted above the technical guidelines for the restricted use of nuclear energy as a fuel for the on-board generation of power is a major achievement. Also in this connection is the provision preventing use for propulsion purposes.

To be treated as positive achievements are the provisions relating to safety assessments, giving of detailed notice respecting the reentry of such a space object, providing for emergency assistance, and references to damages, responsibility, and liability. Highly laudatory was the inclusion of the "biosphere" as an area worthy of protection from radiological hazards.

So that the announced goals of radiation protection and nuclear safety might be realized the Principles call for a limited use of NPS. They are to be employed only when "non-nuclear energy sources" cannot be used reasonably. In the same vein nuclear power plants are not to be made critical before the space object reaches its "operating orbit" or achieves its "interplanetary trajectory."

From the very beginning of the COPUOS negotiations frequent reference was made to the research and standards provided by the International Commission

on Radiological Protection, a private scientific body. The Principles took account of and called for compliance with standards applying in particular to the design, construction, use, and operation of space objects equipped with NPS.

Negative Aspects of the 1992 Principles

In suggesting that there were inadequacies or negative aspects one must proceed with a certain amount of caution. The Principles were obliged to run the stormy pathways of accommodation and compromise in order to obtain the required consensus in COPUOS.

It was not to be expected that the Principles would contain a ringing denunciation against the use of radiological sources, even though some environmentalists would have welcomed an opportunity to portray their moral indignation. The absence of prohibitory language cannot be considered a fault. The reverse is in fact the case. Regulatory language was and is a strength of the Principles.

Yet the regulatory terminology bears careful scrutiny. It is a fact that the Principles are characterized by the use of many very general and vague terms. This can leave an impression of uncertainty or the absence of a firm commitment to high regulatory standards. It can allow for the view there is an on-going reluctance to exercise the "political will" necessitated by the nature of the dangers to humankind and to the biosphere. The following are several illustrations.

Principle 3, entitled "Guidelines and Criteria for Safe Use," and which is the heart of the technical limitations on the use of NPS, provided that such sources were to be used only where there was "a high confidence" that hazards were "kept below acceptable levels . . ." as further defined. The overall goal was to "ensure with high reliability that radioactive material does not cause a significant contamination of outer space." As a part of this situation the "normal" use of NPS was to be at a "sufficiently high orbit" so as to prevent against any "significant radiation exposure."

Another area of vagueness, also found in Principle 3, relates to the suitable design of power systems. Their design is to be such that "the probability of accidents with potentially serious radiological consequences . . . shall be kept extremely small. . . ." The Principles calls for a "significant" reduction in "the possibility of failures" of NPS satellites. To that end it was mandated that "there shall be a highly reliable operational system to ensure an effective and controlled disposal of the reactor."

Perhaps a higher degree of precision is not possible when it comes to the formulation of scientific and legal requirements for the use of NPS in space. Or, it could be urged that more specificity should be set forth in technical manuals for operational activities. Such an approach would allow for a formulation of principles as general guidelines to be followed by the very precise requirements contained in the technical manuals.

Further, consideration must be accorded to the presence of general terminology appearing in international agreements on space activities. While Principles 5, 6, and 7 used such expressions as "frequently as practicable," "reasonably practicable," and "possible harmful effects," similar general terms exist in the

COPUOS-based treaties. For example, the Rescue and Return agreement in Article 5 uses "practicable" in identifying steps to be taken to recover an object or component parts.[3] The same article refers to the elimination of "possible" danger of harm. The 1967 Principles Treaty in Article 5 calls for the rendering of all "possible" assistance to astronauts.[4] The same agreement in Article 9 specifies that there may be a condition of "potentially harmful interference." Both the Registration Convention in Article 6 and the Moon Treaty in Article 5 require the provision of information to the "greatest extent feasible."

Precise terms undoubtedly provide for the greatest protection of those who could be adversely affected by the use of NPS on-board space objects. The Principles contain many qualifying terms which weaken the impact of highly important safety criteria. Perhaps it is not realistic to expect that a higher degree of precision should be found in a set of Principles.

In the long run it will be necessary to determine whether the vagueness of the indicated language, either as Principles or in an international agreement, will be detrimental to the safety and security of those who have most to gain from the safe use of NPS in outer space. In all events the existence of the Principles will put on notice those who use NPS in outer space that their conduct is subject to certain formal prescriptions expressing the will of the world community.

An additional major negative aspect of the Principles was the failure to seize the opportunity to clarify an issue which is central to the mitigation, if not the prevention, of nuclear harms. This has to do with the clarification of the concept of a "launching" State or entity acting alone or in concert with a "procuring" State or entity.

One response to this characterization of the foregoing as a "negative" aspect of the Principles might be that the central purpose of the Principles was restricted to the formulation of technical guidelines and criteria for safe uses of NPS in outer space. Further, it may be asserted reasonably that the clarification of the "launching/procuring" dilemma is in itself a complex matter and that an effort to resolve it within the aegis of NPS discussions would unnecessarily prolong reaching agreement on NPS.

Two separate approaches are contained in the 1992 Principles. Neither has alleviated the international legal tension presently existing respecting the identification of the party or parties who may be liable and responsible for harms and damages resulting from the use of NPS in outer space.

The foregoing is based on the author's belief that the language appearing in Article 7 of the Principles Treaty,[6] in Article 1 of the Damages Convention,[7] and in Article 1 of the Registration Convention fails to identify sufficiently a party liable or responsible for NPS harms and damages. The failure to address this issue in the 1992 Principles, while accepting the present uncertain regime, has served to perpetuate existing ambiguities.

The 1992 Principles offer two basic approaches to the concept of a launching State. Principle 2, "Use of Terms," provides that a "launching State" and a "State Launching" mean the "State which

exercises jurisdiction and control over a space object with nuclear power sources on board at a given point in time relevant to the principle concerned." No fault can be found with this prescription. It is basic to international space law and finds its source in Article 8 of the 1967 Principles Treaty. This Principle does not refer to "procuring" or "procurement."

The foregoing norm of jurisdiction and control applies to the safety assessment provisions of Principle 4. Pursuant to this Principle the launching State (which exercises jurisdiction and control) will have a very wide-ranging responsibility and a duty to engage in a very comprehensive assessment of the factors involved in a launch.

The launching State, as defined above, has, pursuant to Principle 5, responsibilities respecting notification of reentry of a space object. Notice must be given, in the event of malfunction, of the name of the launching State as well as "the territory or location of launch." Again, pursuant to the foregoing definition it is provided in Principle 7, dealing with assistance to States, that such a launching State has duties respecting "the necessary assistance to eliminate actual and possible harmful effects."

It should be noted that in the foregoing Principles reference is made only to a launching State. No reference was made to a "procuring State" or other "procuring" entity.

It may be supposed that the consistent reference to a "State" was not designed to set aside the language of Article 13 of the 1967 Principles Treaty where activities of States party to that agreement include situations where the activities of such States "are carried on within the framework of international intergovernmental organizations." A second approach to the concept of a launching State also is set forth in Principle 2. With respect to the subject of liability and compensation, as it is dealt with in Principle 9, "the definition of the term 'launching State' as contained in that principle is applicable." Here the term "procures," which was so studiously avoided in the context of jurisdiction and control, now becomes relevant. According to Principle 9, after referring to Article 7 of the 1967 Principles Treaty,[9] and to provisions of the 1972 Damages Convention,[10] "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 space objects and their component parts."[11] The 1975 Convention on Registration of Objects Launched into Outer Space, Article 1, uses the same descriptive language.[12]

The identification of a "launching State" and of a "procuring State"[13] must be analyzed in the context of early efforts to identify and clarify the principles of space law particularly with respect to ownership, jurisdiction, control, liability, responsibility (in the dual sense of accountability for harms and for initiating space activities as used in the Rescue and Return Agreement), and registration.[14]

Major problems arise, first, with respect to the identification of a procuring State, second, the legal rights and duties of a procuring State, third, the legal relationship between a launching and a procuring State, and, fourth, the legal relationship between international intergovernmental organizations and other legal persons when

such entities engage in launching or procuring activities.

First, how is a procuring State identified? Reference to the separate functions of launching and procuring of the launch of a space object appears in Article 7 of the 1967 Principles Treaty. It is evident that a distinction was made between the act of launch and the procurement of a launching, for the treaty says "launches or procures the launching. . . ." This clearly suggests that one State could be a "launching" State and another could be a "procuring" State. The later UN-based space treaties, while not employing the same language, may be deemed as not being inconsistent with the foregoing. However, the later agreements are different. Article 1 (c) of the 1972 Damages Convention and Article 1 (a) of the 1975 Registration Convention specify that the term "launching State" means "A State which launches or procures the launching of a space object." This language indicates that a procuring State is a launching State.

This description requires a clear identification of what is meant by the term "procures." In an earlier study it was pointed out that the use of "procures" was not the product of reported negotiating positions taken during the discussions at COPUOS, at the Legal Sub-Committee, or by the First Committee of the General Assembly. The dearth of any specific assignment of meaning to "procures" suggests that it may be considered in its normal and usual sense.[15]

For "procuring" to exist there must be an active initiative on the part of the entity which wishes a launch to take place. Such an initiative would be designed to bring the act of launching into fruition.

The concept of procuring or procurement suggests the need on the part of the procurer for assistance of the kind required for the achievement of the intended objective. Unlike the situation where a State or one of its entities possesses the territorial capability to engage in or to facilitate the launching act, the procurer must enlist the cooperation of another party having launching or facilitating capabilities. Thus, it has been suggested that "most authors seem to favor the view that a State at least has to be somehow actively involved by requesting initiating, or at least promoting the launching of a particular space object in order to consider it as having 'procured' the launching."[16]

Any procured launch could take place in the territory of the launching State, in the territory of the procuring State, or from any State whose facility is used for the launch. In any event, the launch need not take place from the territory or facility of a procuring State. The underlying distinction is that a procuring State is the one which takes the initiative in obtaining a launch from an identified territory or facility. Proof of initiatory activity can be both subjective and objective.

There seems little doubt that the act of procurement can be that of a foreign State, of international intergovernmental organizations, and of a combination of foreign States. To be determined is whether a national non-governmental entity, of the kind contemplated in Article 6 of the 1967 Principles Treaty can engage in the act of procurement.

Strictly speaking Article 6 would allow such a private entity to engage in a procurement thereby placing the State of which the procuring private entity was a

national in the position of a procuring State. The next step requiring resolution is to determine whether the procuring private entity of State A makes State A a procuring State when the indicated launch is to take place in State B. If, as suggested above, a procuring State is also a launching State, then State A as the procuring/ launching State and State B as the State of physical launch must both be considered to be launching States.

The impact of a private entity's procurement of a launch on the determination of what State is a launching State has not always received the analysis provided above. Thus, Professor Böckstiegel has stated that "it seems difficult to share the view that a private enterprise providing a space object for launch by a foreign State would cause the State of the nationality of that enterprise to be considered a launching State."[17] It should be observed in this connection that Professor Böchstiegel used "providing" rather than "procuring." Perhaps a difference in terms would allow for acceptance of this author's view of the different entities which may engage in either a procuring or in a launching activity.

Also to be resolved is the question as to the identification of the "launcher/ procurer." This is of key importance in determining liability and compensation for harms. Presumably where one State has taken the initiative in procuring a launch on its behalf by another State, there will be little difficulty in identifying the responsible party, e.g., the procuring State.

A problem arises when legal entities other than States engage in the procurement of a launch. Such legal entities presumably can be identified as readily as the State, per se. But, this does not immediately resolve the nature of the legal rights and duties between the procuring State and the entities that have sought and paid for the launch. Further, it does not resolve the respective rights and duties between the launching State, the procuring State, and the entities for whom the procuring State has acted on its own account as well as where the procuring State is acting on the behalf of such outside entities. In a practical sense a whole network of legal relationships arise from the above scenario.

To be excluded from the concept of procuring or procurement would be an effort on the part of one governmental agency within a State to obtain a launch on its behalf by another governmental agency of the same State. This internal initiative is beyond the reach of current treaty provisions.

In an increasingly interrelated scientific and technological society, where a finished product is often the result of many components manufactured globally, there is a substantial need to know what is to be identified as a procurement and the circumstances upon which legal liability may be assessed. The 1992 Principles do not satisfactorily address this problem. There is a need for COPUOS to focus very specifically on the meaning to be accorded to launching and procuring in the context of liability and responsibility.

Second, what are the fundamental rights and duties of a procuring State? Are they to be the same as the territorial State which exercises jurisdiction and control of the operational aspects of a launch? Since, under existing treaty law, particularly the

Damages and the Registration agreements, a procuring State is defined as a launching State, the rights and duties of the former must be the same as those possessed by the latter.

In dealing with third parties, e.g., legal entities other than the launching/procuring States, the launching/procuring States will be obliged to conform to existing law on such subjects as identification, registration, rescue and return, and liability for damages. Third parties, in this context, would include other States, combinations of States, and international intergovernmental organizations.

The launching/procuring States would have to be particularly mindful of the provisions of Article 6 of the 1967 Principles Treaty. Under that agreement the nationals of the launching/procuring States may impose responsibility on the State of their nationality for outer space activities. The identity of the launching/procuring States would be known through their compliance with Article 8 of the Principles Treaty and Article 2 of the Registration Convention.

Third, what are the legal rules and principles governing the inter-se relationships between a launching and a procuring State? A procuring State's basic rights and duties are set forth in international treaty law. A procuring State by reason of its appointment of a launching State to provide launch services cannot avoid its treaty obligations. The provisions of Articles 6 and 7 of the 1967 Principles Treaty govern this situation. Undoubtedly, the respective rights and duties of a launching State and a procuring State as to their mutual relationships, which would cover many details, would be normalized by a contract entered into by the two parties.[18]

Fourth, what are the principles governing the legal relationship between international intergovernmental organizations and other legal persons which such organizations engage in launching or procuring activities? Principle 9 treats launching and procuring as a function of States. However, it is well known that other legal entities, including international intergovernmental organizations, engage in such activities. Even so, Principle 9 allows such international organizations to make a claim for damages. Further, Principle 8 stipulates that such international organizations have responsibility for compliance. The responsibility is joint with the other States participating in the organization. Further, pursuant to Article 13 of the 1967 Principles Treaty, duties assigned to States are also to be borne by international organizations. This applies to both acts of launching and of procuring launches. The conclusion can be reached that, since procuring from a legal point of view is the same as launching, that procurement by an international intergovernmental organization is the same as the act of launching and that the organization would occupy the same position with regard to such "procuring/launching" as would be occupied by a "procuring/launching" State. Both the Principles and international space law require a formal clarification of the foregoing. A high degree of certainty is required on these matters.

Neutral Aspects of the 1992 Principles

In addition to the positive and to the negative aspects of the Principles it was suggested that they also have some neutral elements. Unresolved is the final form for the Principles. They could receive the

ultimate approval of the General Assembly as a Resolution or in a somewhat more formal Declaration. An even more impressive formulation would consist of a formal international agreement subject to ratification.

Affecting such a decision would be the fact that many of the legal provisions of the Principles have already received the approval of many States in the five UN-based international agreements on space. Others might urge, but not very persuasively, that the present Principles consist of general customary international law. While this may have some merit respecting some of the legally-oriented terms, this would not be the case with regard to operating and safety standards. Some of the legally oriented Principles, such as the one on "launching/procuring," cannot claim the status of customary international law.

Uncertain Aspects of the 1992 Principles

The Principles appear to be uncertain also in at least one very important area. This relates to their geographical applicability.

It has been urged that the Principles apply to "outer space," which undefined term is a part of the titled assigned to them. The preamble refers to "outer space" five times and makes no mention of the Moon or other celestial bodies. Principle 1 entitled "Applicability of International Law" also uses only "outer space."

Adding strength to this limited view of their applicability is the provision in Principle 3.2.(b) which requires NPS to be activated only in "sufficiently high orbits," and by Principle 3.2.(a)(i) which stipulates that NPS should be used "on interplanetary missions." The Principles also make no mention of the Moon and other celestial bodies, nor do they contain a specific prohibition against the use or presence of NPS on the Moon or other celestial bodies. One expert has concluded that the Principles are limited in their application to outer space excluding the Moon and other celestial bodies.[19] This conclusion, however, has been rejected by N. Jasentuliyana. In his view the Principles deal "with nuclear power sources themselves, wherever found, including the surface of the Moon."[20]

The prospective review of the Principles will allow for a reconciliation of the foregoing views. However, on the basis of the information provided above it would appear that the Principles have application only to the on-board generation of power while the space object is in orbit in outer space, per se.

Conclusion

Members of the world community have suitable cause for their concern over the environmental health of planet Earth and of the far-reaching areas of outer space and of the biosphere, as well as for the Moon and other celestial bodies. The 1992 UN Conference on the Environment and Development has urged that great caution be exercised so as to maximize the well-being of the planet and its animal and plant life.

Harms can be produced by space debris, by the harmful effluents of the fuels used by solid rocket boosters, and by nuclear power sources.

It is one thing to be aware of human and environmental dangers. It is something else to deal effectively with such

dangers. The acceptance in 1992 by the General Assembly of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space is a major initial step to minimize potential harms.

Some weaknesses and areas requiring further clarification have been identified. One major area needing further specificity relates to the respective rights and duties of launching and procuring States and other international legal persons. If it proves unrealistic to address the indicated uncertainties in the context of these Principles, yet the issue is a real one and a suitable forum must be found to provide greater clarity and security.

Since doubt exists as to the geographical coverage of the Principles, early attention must be accorded this issue. Since the technical matters have very wide-ranging support it may now be timely to exploit that support in the form of a new international treaty on nuclear power sources. In this way international law may be able to respond to yet another important challenge which possesses its own special and evolving wants, needs, interests, and values.

NOTES

1. U.N. Doc. A/AC.105/PV 24, 7, 22 Nov. 1963. He made the statement during the consideration of General Assembly Resolution 1962 (XVIII).

2. Report of the Committee on the Peaceful Uses of Outer Space, U.N. GAOR 47th Session, Supp. No. 20, A/47/20, 25, 32 *ILM* 921 (May 1993).

3. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 19 UST 7570, TIAS 5699, 672 UNTS 119.

4. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 18 UST 2410, TIAS 6347, 610 UNTS 205.

5. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, U.N. Doc. A/RES/34/68, 18 *ILM* 1434 (1979).

6. *Supra*, note 4.

7. Convention on International Liability for Damages Caused by Space Objects, 24 UST 2389, TIAS 7762.

8. Convention on Registration of Objects Launched into Outer Space, 28 UST 695, TIAS 8480.

9. *Supra*, note 4.

10. *Supra*, note 7. See particularly Article 1 (c).

11. Italics added.

12. *Supra*, note 8.

13. The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space in Articles 1 and 2 uses the term "launching authority." *Supra*, note 3.

14. C.Q. Christol, "The 'Launching State' in International Space Law," 14 *Annuaire de Droit Maritime et Aéro-*

Spatial 363 (1993). According to Judge Lachs "no difficulties arise when a State launches its own object from its own territory; the same applies to objects owned and launched by non-governmental agencies registered in that State." M. Lachs, *THE LAW OF OUTER SPACE* 70 (1972). However, he also noted that where two States engage in a "joint launching" they must agree which is to be the State of registry with the same requirement to be observed when the launch is effected by an international intergovernmental organization.

15. *Id.* at 372.

16. K-H. Böckstiegel, "The Terms 'Appropriate State' and 'Launching State' in the Space Treaties -- Indicators of State Responsibility and Liability for State and Private Space Activities," *Proceedings of the 34th Colloquium on the Law of Outer Space* 15 (1992). For an earlier discussion focusing more particularly on the concept of a launching State, see *Proceedings of the 24th Colloquium on the Law of Outer Space* 265 (1981).

17. *Ibid.* Italics added.

18. S.E. Doyle, "Legal Aspects of International Competition in Provision of Launch Services," *Proceedings of the 30th Colloquium on the Law of Outer Space* 203 (1988).

19. M. Smith, "Legal Aspects of Using Nuclear Reactors on the Moon," *Proceedings of the 35th Colloquium on the Law of Outer Space* 312 (1993).

20. *Proceedings of the 35th Colloquium on the Law of Outer Space* 429 (1993).