NUCLEAR POWERED SATELLITES: THE U.S.S.R. COSMOS 954 AND THE CANADIAN CLAIM

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INTRODUCTION

ON JANUARY 24, 1978 the Soviet satellite, Cosmos 954, fell from outer space and entered Canada's airspace. The component parts of this nuclear powered satellite disintegrated and scattered radioactive debris over northwest Canada in an area the size of Austria. Fear of a nuclear explosion and unknown hazards to the environment evoked worldwide alarm. This incident set in motion a variety of studies analyzing one of the most unique multidisciplinary problems created by the use and exploration of outer space. These continuing studies of nuclear power for satellites will lead to decisions of global significance. There is an opportunity to contribute to the assessments which are in progress and are likely to become the basis for decisions in the future.

First, the elements of this multifaceted situation must be identified before the patterns of interaction can be ascertained and form the basis for conclusions likely to result in beneficial consequences. The general categories of knowledge required to deal with nuclear powered satellites are: science and technology, economics, national space programs, international space activities, national and international law, the role of the United Nations, the relation of government and industry, the relation of military and civilian space programs, and national security.

Second, scientific and technological answers must be sought prior to developing legal regulations. If there is a technological solution, there may not be a legal problem, or at least the law would have a different shape. Even an observant and analytical mind can come to an erroneous conclusion if scientific and technological facts of space activities are not taken into account; and nowhere is this more true than for the use of nuclear power as a source of energy for satellites.

Third, in order to improve international space law, existing treaties must be examined for any inadequacies in covering hazardous situations created by space activities. Lawyers sometimes wait until after a treaty is

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ratified before analyzing the meaning of certain words and then the legal profession's effectiveness is limited to subsequently arising cases. If all the facts are studied now, texts can be proposed for provisions governing nuclear powered satellites while matters are under discussion and prior to final adoption of an international agreement.

I. SOVIET SATELLITE COSMOS 954 AND U.S. INVOLVEMENT

The U.S.S.R. launched its Cosmos 954 satellite on September 18, 1977.[1] The satellite carried a nuclear reactor using uranium enriched with isotope of uranium-235. Designed as an ocean surveillance satellite covering the Atlantic and Pacific, Cosmos 954 was to function with a partner, Cosmos 952, which orbited the Earth for three weeks and was then successfully raised to a higher orbit where its radioactivity could naturally decay in the course of some 600 years. Cosmos 954, however, malfunctioned and consequently could not be sent into higher orbit as planned. This lower orbit subjected Cosmos 954 to the force of gravity so that the satellite was drawn toward the Earth.

A White House task force monitored the situation and on January 12, 1978, President Carter personally contacted the U.S.S.R. and offered the assistance of the United States in predicting where the satellite might fall. The U.S.S.R. explained that the satellite was designed to destruct upon re-entry into the Earth's atmosphere and that it was impossible to produce an atomic explosion; the satellite was not a bomb or a weapon. Congressional leaders and other nations with tracking capabilities were then notified by the White House of the satellite's condition. A few minutes after Cosmos 954 entered Canadian airspace, President Carter called Prime Minister Pierre Trudeau and offered assistance which was accepted. The United States furnished experts and specialized equipment in radiation detection for the search and recovery operation.[2] Dr. Z. Brezinski, the President's Assistant for National Security Affairs, stated that the situation "was handled through very effective international cooperation, involving the Soviets also."[3]

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[1] STAFF OF SENATE COMM. ON AERONAUTICAL AND SPACE SCIENCES, 94th Cong., 2d Sess., REPORT ON SOVIET SPACE PROGRAMS, 1971-75; OVERVIEW, FACILITIES AND HARDWARE, MANNED AND UNMANNED FLIGHT PROGRAMS, BIOASTRONAUTICS, CIVIL AND MILITARY APPLICATIONS, PROJECTS OF FUTURE PLANS (Comm. Print 1976).

[2] Press Conference by President Carter on Nuclear Powered Satellites (January 27 and 30, 1978); Selected Statements of President Carter (Mar. 1, 1978) at 52-54; *See* Perry, *Russian Ocean Surveillance Satellites*, 18 ROYAL A.F.Q. 60 (1978).

[3] Briefing by Zbizniew Brzezinski, Assistant to the President for National Security Affairs, and Benjamin Huberman, Senior Advisor for Technical Affairs, National Security Council Staff, White House Press Secretary (January 25, 1978).

II. UNITED NATIONS CONSIDERATION OF NUCLEAR POWER SYSTEMS IN SPACE

Despite assurances from space scientists that the use of nuclear power sources on satellites carries no danger of a nuclear explosion, there is continuing worldwide public concern about the risks, safety standards, and notification procedures for such launchings, particularly those in Earth orbit. Explanations and debate on the matter first came to a focus in the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, and was later discussed during sessions of the Legal Subcommittee. This Legal Subcommittee was the forum for the successful negotiation by consensus of the four outer space treaties now in force.[4] It is fortunate that the United Nations is already organized and has a history of successful experience in approaching complex outer space problems which require international cooperation.

During 1978, both subcommittees and the full Committee discussed the scientific, technological and legal implications of using nuclear power systems for space vehicles. Although the subject was not specifically itemized on the agenda, its importance secured not only prominent attention under the category "Other Matters" on the Scientific and Technical Subcommittee's agenda and the full Committee's agenda, but also resulted in action for consideration by the Scientific and Technical Subcommittee at its 1979 session. Forty-seven nations are now represented on the Committee for the Peaceful Uses of Outer Space and the extensive verbatim records reveal the intensity of international concern on this subject. At the same time, the delegates recognized that any action depended upon an objective statement of the scientific and technical facts.

The Scientific and Technical Subcommittee was the first to report its discussions on the use of nuclear power sources in outer space during its fifteenth session, February 13, 1978 to March 2, 1978.[5] The Canadian delegation proposed the creation of a working group of technical and scientific experts to analyze all facets of the problem of avoiding damage to or harmful contamination of outer space and the Earth through the use of nuclear satellites. A working paper was co-sponsored by Australia, Canada, Colombia,

[4] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Oct. 10, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205; Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Dec. 3, 1968, 19 U.S.T. 7570, T.I.A.S. No. 6592, 672 U.N.T.S. 119; Convention on International Liability for Damage Caused by Space Objects, Oct. 9, 1973, 24 U.S.T. 2389, T.I.A.S. No. 7762; Convention on Registration of Objects Launched into Outer Space, Sept. 15, 1976, T.I.A.S. No. 8480.

[5] Report on the Fifteenth Session (Feb. 13 to Mar. 2, 1978) of the Scientific and Technical Subcomm. of the U.N. Comm. on the Peaceful Uses of Outer Space, U.N. Doc. A/A.C. 105/216 (Mar. 6, 1978).

Ecuador, Egypt, Italy, Japan, Nigeria, and Sweden proposing the terms of reference for the working group.[6] Under this proposal, the experts would report to the Scientific and Technical Subcommittee and participation would be open to all forty-seven members of the United Nations Committee on the Peaceful Uses of Outer Space. Principally, the working group would study available alternative power sources and determine the technical feasibility of establishing standards for radiation levels, restrictions on nuclear power sources, safeguards, precautions, early notification of re-entry and emergency assistance for search, recovery and clean up operations. On the basis of technical facts, the working group would then recommend a multilateral regime of standards, safeguards and limitations. It was also proposed that the ad hoc working group report its progress to the full Committee at the June-July 1978 session.

During the course of the Scientific and Technical Subcommittee session, Stephen E. Doyle, the United States Representative, stated that the use of nuclear power sources in outer space is properly a subject for the United Nations Outer Space Committee.[7] He pointed out the necessity for differentiating between various types of systems employed as nuclear power sources in space such as nuclear reactors, radioisotope thermoelectric generators and other scientific devices, because they have implications for precautionary safety measures. The United States supported Canada in proposing a technical working group which would consider all viewpoints, the full range of implications and future actions taken on an informed basis. Mr. Doyle stated that:

> the United States is pleased to make a standing offer to provide assistance in search and clean up of radioactive debris from re-entering space objects belonging to any country, as well as assistance in providing emergency services to the people of any country injured by such debris.[8]

Unable to reach a consensus on establishing this technical working group, the Subcommittee recommended that the full Committee define its role and that of its subcommittees and determine whether a working group of experts could be created.

The United States submitted to the Committee on the Peaceful Uses of Outer Space a working paper on "Uses of Radio-Active (Nuclear) Materials by the United States of America for Space Power Generation."[9] The

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[6] *Id.* at 28-32.

[7] Statement by Stephen E. Doyle, U.S. Rep. to the Scientific and Technical Subcomm. of the U.N. Comm. on the Peaceful Uses of Outer Space, U.S. Mission to the United Nations, Press Release USUN-3(78) (Feb. 15, 1978).

[8] *Id.*

[9] U.N. Doc. A/A.C. 105/L. 102 (Mar. 15, 1978).

report explained that nuclear power sources for satellite energy are used by the United States for deep space, interplanetary missions and lunar landings. In remote, hostile or special environments, solar cells for power will not survive. Thus, missions involving Mars, Jupiter and Saturn all require energy from nuclear power, and such will be used for the Jupiter Orbiter/Probe (Galileo) approved by the Congress in 1977 for launching in 1982. NASA has not used nuclear power for earth orbits, however, except for the Nimbus III satellite in 1969.

There are stringent United States review procedures to ensure safety when nuclear power is used for space vehicles. Every space system must meet the requirements of an Environmental Impact Statement.[10] The Interagency Nuclear Safety Review Panel scrutinizes the safety of proposed space systems in order to prevent contamination of the Earth and injury to people. The necessity for the mission and its cost effectiveness are also evaluated. If passed by this review panel, the proposal for the space system is then sent to the President who must approve any nuclear powered spacecraft. It should be noted that in his press conference on January 30, 1978, President Carter stated:

> I would favor at this moment an agreement with the Soviets to prohibit Earth-orbiting satellites with atomic radiation material in them . . . . The only time a satellite needs a long-lasting power source that's free of the use of solar energy, which can be derived from the sun, is when you go into deep outer space; for instance, if we send a probe to the outer planets, there would not be an adequate source of energy from the sun to trigger our solar cells. And we might need power from atomic sources then.[11]

On October 17, 1978, United States Ambassador Richard W. Petree spoke before the United Nations Special Political Committee on the Report of the Committee on the Peaceful Uses of Outer Space. Ambassador Petree stated that:

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[10] An Environmental Impact Statement must be filed pursuant to The Clean Air Act, 42 U.S.C. § 4332 (1977) which states in pertinent part:

> (2) all agencies of the Federal Government shall —
> (c) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on —
> (i) the environmental impact of the proposed action,
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
> (iii) alternatives to the proposed action,
> (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
> (v) any irreversible and irretrievable committments of resources which would be involved in the proposed action should it be implemented.

[11] Press Conference by President Carter on Nuclear Powered Satellites (Jan. 30, 1978).

> One of the most difficult and significant issues within the Outer Space Committee's jurisdiction is that of nuclear power sources for space. Certain benefits that may be realized from the application of space technology present energy requirements that may best be met by nuclear power sources. The safe use of such sources demands that precautions be taken against hazards to humanity. The United States adheres to practices and procedures designed to safeguard against these hazards. We have found it possible to operate nuclear power sources in space in a manner that takes into account the various exigencies that might be expected to occur on launch, operation or accidental re-entry.[12]

During the meeting of the full Committee, the Soviet delegate, Boris Maiorski, remarked that current and future space programs depend upon the development of nuclear power sources which are superior to solar batteries.[13] He perceived their potential advantages over other sources as:

> self contained operation and independence of the amount of illumination in a given region [as compared with solar batteries]; compact construction, greatly facilitating the operation of the space vehicle, simplifying the orientation system and significantly reducing the energy required to keep the vehicle in its orbit; high stability in the radiation belts of the earth; improved weight and size characteristics, beginning with certain levels of power, as well as the possibility of improving the specific mass-energy characteristics with increased power and safe life.[14]

Mr. Maiorski additionally pointed out that nuclear reactor power systems

> can be used on board space vehicles operating in either low or high earth orbits and in deep space. . . . The testing and operation of such systems is carried out under the constant supervision of inspection bodies, whose duties include monitoring the implementation of measures to safeguard public health and the surrounding environment.[15]

He also stressed the importance of isotope capsules remaining sealed if they return to Earth, reliable tracking for location and evacuation, attaining orbit before the reactor reaches its power level, and excluding the possibility of uncontrolled flight.[16] Finally, he stated:

> The Soviet Union is willing to provide foreign States with assistance in locating and, if necessary, deactivating the remnants of space objects

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[12] Statement by Richard W. Petree, U.S. Ambassador to the United Nations, to U.N. Special Political Comm., U.S. Mission to the United Nations, Press Release USUN-94(78) (Oct. 17, 1978).

[13] Verbatim Record of the U.N. Comm. on the Peaceful Uses of Outer Space (180th mtg.) held July 5, 1978, U.N. Doc. A/A.C. 105/P.V. 187 (July 13, 1978).

[14] *Id.* at 31.

[15] *Id.*

[16] *Id.* at 37, 38-40.

> carrying nuclear power sources in the event of an accidental return to earth. . . . We should like to recall that as soon as the existence of the satellite Cosmos 954 came to an end over the territory of Canada, the Soviet Government offered immediate assistance to the Government of Canada in eliminating the consequences of that incident. The question of how that aid was used relates to an area in which every Government makes an independent and sovereign decision.[17]

At the same Committee meeting, the Canadian delegate, Erik B. Wang, Director of the Legal Operations Division of the Department of External Affairs, pointed out that Canada had questioned the use of nuclear power sources in outer space on February 8, 1978, during a session of the United Nations Scientific and Technical Subcommittee because of the international implications of concern to all nations, and proposed measures for developing an international regime of safety standards.[18] He then announced that the debris of Cosmos 954 was scattered over a wide area, most of the pieces were radioactive, the search and recovery operation was complicated and expensive, and the total cost as of July 1978 was twelve million dollars. Mr. Wang further stated:

> With respect to the question of liability and compensation in relation to that incident, Canada has notified the Government of the Soviet Union, with which we have been in close touch from an early stage, that we will be submitting to the Soviet Union a claim for damages, including search and recovery costs incurred by Canada, as a result of the contamination of Canadian territory by radio-active component parts of the Soviet satellite. That claim will be made in accordance with international law and relevant international agreements, including the 1972 Convention on International Liability for Damages Caused by Space Objects, to which both Canada and the Soviet Union are parties. Since the search and recovery operations necessary to restore the territory to the condition in which it existed before the damage occurred are still under way, the full amount of damages is not yet known. The claim will be submitted in due course to the Soviet Government through bilateral channels.[19]

In regard to Canadian-Soviet cooperation on the matter, Mr. Wang said that the Canadian government appreciated the Soviet Union's offer to assist but that it had come after the search operation had been started by the Canadian armed forces and other agencies and that Canada had already accepted an offer from President Carter which had been extended on the morning of January 24, 1978, the day Cosmos 954 crashed. It was Mr.

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[17] *Id.* at 41-46.
[18] *Id.*
[19] *Id.* at 26-27.

Wang's belief that some of the necessary information on the satellite had been obtained from Soviet authorities but not enough was received and the transmittal of some data had been delayed. The Canadian delegate stated, however, that there might be an opportunity for future cooperation between Canada and the Soviet Union in disposal, outside of Canada, of the accumulating radioactive materials.[20]

The Legal Subcommittee met from March 13, 1978 to April 7, 1978 and agreed to request the full Committee to instruct its subcommittees concerning nuclear power sources in outer space. Although the Subcommittee did not officially discuss the subject, a working paper describing areas in need of analysis was circulated by Australia, Belgium, Canada, Chile, Colombia, Egypt, the Federal Republic of Germany, Iran, Italy, Japan, Kenya, Mexico, Sierra Leone, Sweden and the United Kingdom of Great Britain and Northern Ireland.[21] The major elements which should be analyzed, according to the working paper, are safety measures, notification, and emergency assistance. The paper also called for "substantive discussion" on the legal aspects of using nuclear power sources in outer space.

By the time the full Committee on the Peaceful Uses of Outer Space convened its twenty-first session, June 26, 1978 to July 7, 1978, a consensus had developed for pursuing the nuclear power question in the future. The Committee therefore requested the Scientific and Technical Subcommittee to include the subject in its next session, to consider the technical aspects and safety measures and report its findings to the Committee. It was suggested that Member States send experts to participate in the technical discussions. The Committee "recommended that the Scientific and Technical Subcommittee should, unless it decides otherwise, create a working group of experts open to all its members to meet during the session and report to the Subcommittee."[22] The plan was for the working group to meet during the session's first week in order to make an early report to the Subcommittee and, if necessary, the Subcommittee could then extend its session for an additional week.[23] Allowance for such additional time is unusual and is an indication of the importance attached by the delegates to the subject of nuclear power for satellites.

When the United Nations General Assembly passed its resolution on International Co-operation in the Peaceful Uses of Outer Space on November

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[20] *Id.* at 66.

[21] Report on the Seventeenth Session (Mar. 13 to Apr. 7, 1978) of the Legal Subcomm. of the U.N. Comm. on the Peaceful Uses of Outer Space, U.N. Doc. A/A.C. 105/218, Annex IV (Apr. 13, 1978).

[22] Report of the U.N. Comm. on the Peaceful Uses of Outer Space, G.A. Supp. (No. 20 A/33/20) (1978).

[23] *Id.*

10, 1978, it included the following directives to the Scientific and Technical Subcommittee scheduled to meet in New York from February 5 to 23, 1979:

> *Approves* the decision of the Committee to request the Scientific and Technical Sub-Committee to include in its agenda consideration of technical aspects and safety measures relating to the use of nuclear power sources in outer space for which purpose the Committee recommended that the Sub-Committee should, unless it decides otherwise, create a working group of experts open to all its members to meet during its session in accordance with paragraph 76 of the report of the Committee.
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> *Requests* launching States to inform States concerned in the event that a space object equipped with nuclear power sources on board is malfunctioning with a risk of re-entry of radioactive materials to the Earth.[24]

III. APPLICABILITY OF OUTER SPACE TREATIES TO THE SOVIET SATELLITE COSMOS 954

Canada, the U.S.S.R. and the United States are among the nations that have ratified all four existing space treaties: (1) 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;*[25] (2) the *1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space;*[26] (3) the *1973 Convention on International Liability for Damage Caused by Space Objects;*[27] and (4) the *1976 Convention on Registration of Objects Launched into Outer Space.*[28] Provisions in each of these treaties are applicable to the Soviet Cosmos 954 incident.

The *1967 Treaty on Outer Space* is a general, guiding instrument and the practice has been to elaborate its articles into new international agreements when necessary. Thus, the three later treaties have their origin in relevant provisions of the *1967 Treaty on Outer Space.*

Articles VI, VII and VIII of the *1967 Treaty on Outer Space* should be studied for their relevance to the situation involving Cosmos 954. Article

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[24] G.A. Res. on International Co-operation in the Peaceful Uses of Outer Space, U.N. Doc. A/RES/33/16 (Nov. 10, 1978).

[25] 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205. [hereinafter cited as 1967 Treaty on Outer Space].

[26] 19 U.S.T. 7570, T.I.A.S. No. 6092, 672 U.N.T.S. 119.

[27] 24 U.S.T. 2389, T.I.A.S. No. 7762.

[28] T.I.A.S. No. 8480; *see* Dembling, *Cosmos 954 and the Space Treaties,* 6 J. OF SPACE L. 129 (1978); Matte, *Cosmos 954: Coexistence Pacifique et Vide Juridique,* 3 ANNALS OF AIR AND SPACE L. 483 (1978); Dembling & Kalsi, *Pollution of Man's Last Frontier: Adequacy of Present Space Environmental Law in Preserving the Resource of Outer Space,* 20 NETHERLANDS INT'L L. REV. 125 (1963).

VI provides that "States Parties to the Treaty shall bear international responsibility for national activities in outer space. . . and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty."[29]

Article VII provides 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.[30]

Article VIII includes a provision that:

> Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return.[31]

Article IX does not specifically apply to the Cosmos 954 incident, but the wording underscores the psychological attitude of the framers who were concerned with "cooperation and mutual assistance" and avoiding "harmful contamination" and "adverse changes" of the Earth's environment.[32]

The *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space* provides a basis for Canadian claims. On February 8, 1978 the Government of Canada notified the United Nations Secretary General and the Soviet Union that radioactive component parts from Cosmos 954 were located in Canada's Northwest Territories. There was continued notification as radioactive debris was specifically identified. The notice is in accordance with Article 5, paragraph 1 which provides that:

> Each Contracting Party which receives information or discovers that a space object or its component parts has returned to Earth in territory under its jurisdiction or on the high seas or in any other place not under the jurisdiction of any State, shall notify the launching authority and the Secretary-General of the United Nations.[33]

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[29] 1967 Treaty on Outer Space.
[30] *Id.*
[31] *Id.*
[32] *Id.*
[33] 19 U.S.T. 7570, T.I.A.S. No. 6092, 672 U.N.T.S. 119.

Article 5, paragraph 2 of the same treaty may be analyzed for its applicability to this situation. After discovering component parts of a space object on its territory, Canada "upon the request of the launching authority [the U.S.S.R.] and with assistance from that authority, if requested, [shall] take such steps as it finds practicable to recover the object or component parts."[34] As previously discussed, Canada did not request the Soviet Union to assist in the recovery. Paragraph 3 requires component parts to be returned or held at the disposal of the U.S.S.R., but again, the requirement of this paragraph depends upon a request from the Soviet Union which has not thus far indicated a desire to retrieve the debris.[35] Paragraph 4 can apply to the Soviet Cosmos 954 situation in that Canada, having discovered hazardous component parts on its territory, may notify the U.S.S.R. which is then obliged to "eliminate possible danger of harm" under the "direction and control" of Canada.[36] Presumably, this provision would be applicable if Canada requested the U.S.S.R. to assist in disposing outside of Canada, of the radioactive debris collected. Paragraph 5 provides that expenses incurred in recovering component parts "shall be borne by the launching authority," but this is with due regard for paragraphs 2 and 3 which require some interpretation and negotiation under the circumstances.[37] It is more likely that provisions of the *Liability Convention* will cover the situation.

The *Convention on International Liability for Damage Caused by Space Objects* makes it clear in Article I that a space object "includes component parts . . . as well as its launch vehicle and parts. . . ."[38] Article II provides that the launching State "shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the earth or to aircraft in flight."[39] Under Article VIII, paragraph 1, Canada, having suffered damage, can present to the U.S.S.R. a claim for compensation.[40] Article X, paragraph 1, establishes a one-year period following the incurrence of damage in which a claim may be submitted, but paragraph 2 allows an extension of the one-year time limit in order to establish facts concerning the damage.[41] These time limits apply, according to paragraph 3, "even if the full extent of the damage may not be known."[42] As discussed above, Canada has made a continuous search and recovery effort since the Cosmos 954 impacted.

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[34] *Id.*
[35] *Id.*
[36] *Id.*
[37] *Id.*
[38] 24 U.S.T. 2389, T.I.A.S. No. 7762.
[39] *Id.*
[40] *Id.*
[41] *Id.*
[42] *Id.*

The search, involving trained personnel and special equipment, had to be made twice — once during ice and snow cover and again after melting.

Article XII requires that compensation "shall be determined in accordance with international law and the principles of justice and equity," and that the State will be restored "to the condition which would have existed if the damage had not occurred."[43] Article XIII would require the U.S.S.R. to compensate Canada in Canadian currency.[44] In the event the claim cannot be settled through diplomatic negotiations, a Claims Commission can be established at the request of either the Soviet Union or Canada pursuant to Article XIV.[45] Articles XV through XX set forth the rules governing the Claims Commission whose decision shall be final if agreed upon by Canada and the U.S.S.R. but otherwise shall be a recommendation and made public.[46]

Article XXI of the same treaty could have applied if the damage caused by the radioactive debris presented a "large-scale danger to human life" or seriously interfered with "the living conditions of the population or the functioning of vital centers," in which case rapid assistance, particularly from the launching State, would have been necessary.[47] Cosmos 954 fell in a relatively unpopulated area, however, and until Canada's recovery operation is fully completed, it will not be known whether this Article applies. Other provisions, however, cover the actual damage identified.

The *Convention on Registration of Objects Launched into Outer Space* repeats in Article I the definition of space object as including its component parts.[48] Article IV applies to the Cosmos 954 situation because it requires notification to the United Nations Secretary General of space objects already registered but no longer in earth orbit.[49] It has been the practice of the U.S.S.R. to register its space objects with the United Nations even prior to the negotiation of this Convention which it ratified on January 13, 1978.

Article VI applies to the circumstances under which the United States rendered assistance to Canada in regard to Cosmos 954. The Article provides that States with space monitoring and tracking facilities shall respond with assistance to a request by a State which has identified a hazardous or deleterious situation and that "[a]rrangements under which such assistance shall be rendered shall be the subject of agreement between the parties concerned."[50]

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[43] *Id.*
[44] *Id.*
[45] *Id.*
[46] *Id.*
[47] *Id.*
[48] T.I.A.S. No. 8480.
[49] *Id.*
[50] *Id.*

IV. CANADA'S CLAIM TO THE U.S.S.R. FOR COMPENSATION

On January 23, 1979, Canada's Secretary of State for External Affairs presented to the U.S.S.R. Ambassador its claim for compensation as a result of the damage caused by "the intrusion into Canadian air space and break up over Canadian territory of the Soviet Cosmos 954 satellite on January 24, 1978."[51] Canada considered the intrusion of the satellite a "harmful trespass" and a violation of its sovereignty. Although Canada spent $13,970,143.66, the claim to the U.S.S.R. is for $6,041,174.70, an amount reasonably related to the satellite debris and not including administrative and other types of expense.

The claim was made on the basis of relevant international agreements, general principles of international law and specifically the *1972 Convention on International Liability for Damage Caused by Space Objects*. Under the *Liability Convention* (Article II), the U.S.S.R. was identified as the launching State and therefore considered by Canada to be absolutely liable for damage to property. Canada stated that the U.S.S.R. did not give prior notice of possible re-entry or answer questions immediately. Canada observed Article VI in handling the damage and in accordance with Article XII based its claim for compensation on restoration of the territory to the condition it enjoyed before the damage. Canada also called attention to Article VII of the *Treaty on Outer Space* which obligates the U.S.S.R., in the case of the Cosmos 954, to compensate Canada in accordance with international law.

In accordance with international and domestic law, Canada was obliged to undertake the search, recovery and clean up operations. Furthermore, attention was called to the fact that the high risk of space activities makes them subject to absolute liability.

Finally, Canada made three reservations: (1) the right to make additional claims if more damage is identified; (2) the right to claim from the U.S.S.R. the total cost if a Claims Commission is established; and (3) the right to claim a reasonable rate of interest from the date of a decision by the Claims Commission.

The U.S.S.R. had not replied to the Canadian claim as of April 1979.

CONCLUSION

Scientific and technological knowledge about the uses and effects of nuclear power as an energy source for satellites is well advanced. Scientists

[51] Canada Presents Cosmos 954 Claim to U.S.S.R. Dept. of External Affairs, Ottawa, Canada, No. 8, January 23, 1979. *See also* U.N. Doc. A/A.C. 105/214 and 214/Corr. 1, Feb. 8, 1978; U.N. Doc. A/A.C. 105/217, Mar. 6, 1978; U.N. Doc. A/A.C. 105/236, Dec. 22, 1978.

and engineers are motivated to have their projects function successfully with a maximum of safety and a minimum of danger to individuals and the environment. They will be able to provide the basis for safety standards.

Legal experts must know the scientific, technological and economic facts before proposing solutions to problems caused by the use of nuclear powered satellites. If a problem can be solved through science and/or technology, legal regulation and control may not be necessary.

The general public and governments throughout the world are aware of the potential dangers arising from the use of nuclear power sources. This alertness can be depended upon to produce an international momentum toward protecting life and the environment.

Radioactive debris such as that scattered by Cosmos 954 is not the only type of contamination or potential adverse impact which can occur in the conduct of space activities. International legal controls and regulations are needed to cover all possible dangers and should not be focused narrowly on only one type of damage.

The pattern of international space cooperation is already well established and the focal point for decision and action has been successfully functioning for some years, *i.e.*, the United Nations Committee on the Peaceful Uses of Outer Space and the Outer Space Affairs Division.

No difference exists between the United States and the U.S.S.R. in regard to the necessity and desirability of using nuclear powered satellites for deep space missions. Some missions could not be undertaken without using nuclear power and this fact is recognized by scientists and engineers throughout the world. The difference between the United States and the U.S.S.R. is in the use of nuclear power for satellites which orbit the Earth, a difference between the U.S.S.R. and many other countries as well. Therefore, a major issue is whether nuclear power should be used for satellites which orbit the Earth.

It is important to understand that the production of electricity from the decay of radioactive materials in order to provide energy for a satellite is not to be confused with a bomb that can explode. Such confusion has never been in evidence in discussions in the United Nations Committee on the Peaceful Uses of Outer Space and its subcommittees.

The existing space treaties should be studied to determine in what ways they are adequate and where they fall short of meeting probable future problems. The treaties should also be analyzed to determine if they are in harmony with respect to provisions against contamination, adverse circumstances, and other dangers. There is a different membership roster for each

treaty and this could cause problems if States could choose which treaty provision to honor. It is also necessary to study the international law that might apply to nuclear satellite problems in addition to the space treaties.

Some thought might also be given to the use of the word "pollution" as a general term to cover all forms of adverse circumstances. The word conveys no sense of urgency because each situation it is designed to cover has a different tolerance depending upon its time frame for solution. Several years can be safely taken to purify a river but some adverse conditions are inadmissible at the start. Mistakes have been made previously by using certain words which trigger reactions not germane to an activity. For example, the phrase "province of all mankind" in the *1967 Treaty on Outer Space,* when translated into Spanish implies sovereignty over territory, a meaning exactly opposite to that intended. In using the word "resources" for the first Earth Resources Technology Satellite (ERTS), unnecessary obstacles were created because the word triggered accusations of neocolonialism. The implications of translating the word "pollution" into all languages are not known and therefore need to be studied.

The time and basic materials are at hand for individuals and organizations to make a contribution to an analysis of problems involved in the use of nuclear power sources for satellites and to make recommendations for solution. There is a rare opportunity for formulating international law.