External Affairs Canada Affaires extérieures Canada

Statements and Speeches

No. 78/1

USE OF NUCLEAR-POWER SOURCES IN OUTER SPACE

A Statement by Mr. William H. Barton, Ambassador and Permanent Representative of Canada to the United Nations, to the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, February 13, 1978.

Normally our opening statement to a session of this subcommittee would be devoted to the full range of agenda items before us. This year, however, we wish to inform this subcommittee of a recent serious incident involving the re-entry and impact in Canada of a satellite with radioactive materials. We also wish to draw the attention of the subcommittee to some of the disturbing implications of this incident and to make some proposals for follow-on study and action. It is fortuitous that this session of the subcommittee follows closely the developments I now shall outline. In our view, the United Nations Committee on the Peaceful Uses of Outer Space, with its subcommittees, is the forum where this matter should most appropriately and logically be introduced and first considered.

On the morning of January 24, 1978, components of a space object containing a nuclear-power source fell on Canadian soil, fortunately in a largely-uninhabited part of the country. The debris that has since been located in Canada's Northwest Territories is believed to consist of component parts of the satellite launched by the Soviet Union on September 18, 1977, and known as *Cosmos 954.*

The technical facts of the situation are as follows. The space object in question entered the earth's atmosphere at 0653 Eastern Standard Time north of the Queen Charlotte Islands, on Canada's Pacific Coast. Subsequently, following approximately a three-minute burn period during re-entry, some pieces of the satellite impacted in the Northwest Territories and have been located between Great Slave Lake (62°N 114°W) and Baker Lake (64°N 96°W). The Canadian authorities had earlier learned of the possibility of uncontrolled re-entry of this satellite, which had shown signs of instability and decaying orbit in previous weeks. However, no accurate predictions were available to us as to the time and area of re-entry in the earth's atmosphere or the point of impact. Nor did we have any information as to the degree of disintegration of the object likely to occur on re-entry in the atmosphere.

We were informed by the Soviet Union after impact that the satellite contained a nuclear-power reactor fuelled by enriched uranium 235. A major search and recovery operation was mounted, led by the Canadian Armed Forces and the Atomic Energy Control Board of Canada, with assistance from other agencies. Valuable assistance was also rendered by technical experts and equipment provided by the U.S. Government. The search, which still continues, has located a number of satellite fragments, some by radiation-detection and some visually. A number of these fragments have been confirmed beyond doubt to be parts of the space vehicle. Up to the present, there have been no reports of injury to persons, but any assessments at this stage would be

clearly premature. Several pieces of debris were found to be radioactive, and one piece, in particular, contained a high level of radioactivity and required very special handling techniques. This piece registered 200 roentgens an hour on contact. This level of radiation would have significant somatic effects for any person closely exposed to it for one hour, or could become lethal if the exposure were prolonged over three hours. This piece has been removed in a specially-constructed lead container. Within a total current search area of 50,000 square kilometres, debris has so far been located along the projected orbit track of *Cosmos 954* over a distance of approximately 750 km. The search-and-recovery operations have been hampered by severe winter weather conditions. The search by air and on the ground will be continued through the coming weeks, and is expected to be extended after the spring thaw into the summer months.

It is not yet known whether any parts of the irradiated fuel core survived re-entry. Extensive environmental monitoring of flora and fauna may be necessary to ensure against exposure of inhabitants in the area and to determine the extent of the contamination of the environment. Even small particles of such fuel, containing fission products, could result in contamination with long-term effects, taking into account the fact that some of these fission products have half-lives of many thousands of years.

On the basis of the information available, and in accordance with Article V, Paragraph 1, of the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Canada formally notified the Secretary-General of the United Nations and the Government of the Soviet Union on February 8, 1978, of the discovery on Canadian territory of component parts of the space object. The text of the notification has, at our request, been circulated to member states as Documents A/AC.105/214 and 214/Corr.1.

Against this background, the Canadian Government considers it essential that various disturbing implications of this incident be carefully considered in the Outer Space Committee and its subcommittees. The implications are of concern to all members of the international community. This committee and its subcommittees can make a significant contribution to our understanding of the complex issues raised by the use of nuclear-power sources in space and of the follow-on action that would be appropriate.

Canada initiated last week a preliminary round of consultations with 37 members of this subcommittee. These consultations, which are still under way, are necessarily of an informal and exploratory nature, but we have been encouraged by the positive response of other governments to date. There appears to be strong support for our proposal for early consideration of the wider implications of this incident for the international community, including the scientific and technical as well as the legal implications. We received a number of useful comments and suggestions as to how the matter could be pursued in the committee and its two subcommittees. Unitl we have had a further discussion of the issues here, it would be premature for my delegation to make any specific proposals for follow-on action. Needless to say, we have no wish

to anticipate decisions that will appropriately be taken at a later stage in the Legal Subcommittee and in our parent committee. Permit me, however, to express some preliminary thoughts, as a possible basis for discussion, on the direction and focus of our efforts in this regard.

Let me say, first of all, that we have no wish to comment further in this subcommittee on the particular circumstances of the landing of the *Cosmos 954* satellite in Canada. We have from an early stage been in close touch with the Soviet authorities, who have provided information on the technical characteristics of the satellite that could assist us in the ongoing search from radioactive debris. We have requested further information. We intend to continue to discuss these and other aspects of the incident, including liability and compensation aspects, through bilateral channels. Our concern here is with the general questions posed by the use of nuclear-power sources in outer space.

Satellites carrying nuclear-power sources have on previous occasions been launched by the Soviet Union and by the United States. We understand that, in all, approximately 40 satellites of this kind have been placed in earth orbit or used for lunar or distant interplanetary exploration. This is a small percentage of the total number of satellites placed in outer space. However, because of the potential hazards to mankind and its environment, these satellites pose a number of special questions that should be addressed by the UN and by this subcommittee. The *Cosmos 954* satellite is not the first satellite carrying radioactive materials that has malfunctioned and unexpectedly returned to earth. With any increase in the size and number of nuclear-powered spacecraft in future, the risks would increase. Clearly, the utilization of this technology in outer space calls for special precautions and a special regime of international co-operation designed to ensure the safety and integrity of the human environment.

What is required, in our view, is a measured, realistic and constructive response to the issues raised by this incident. The use of nuclear power in space is a highly-sophisticated and evolving area of space technology. It holds out the promise of important benefits to mankind, as well as posing certain grave hazards. Any consideration of the problem must take into account both the benefits and the hazards, with a full knowledge of the technical background. We must approach the question of the use of nuclear-power sources in outer space in the same spirit in which we approach the question of international co-operation on nuclear-power sources on the ground. There are no easy answers and we are not proposing any hasty action.

The overall objective of our efforts should be to develop a regime for the use of nuclear-power sources in outer space that would ensure the highest standards of safety for mankind and protection for the environment. The obligation to avoid damage or harmful contamination to outer space and the environment of the earth is already enshrined in several provisions in treaties negotiated in the Committee on the Peaceful Uses of Outer Space and other international instruments and principles of customary international law.

In order to carry out the detailed review and technical studies required, we shall be

proposing the establishment of a working group of technical and scientific experts. Such a working group could be constituted along lines similar to earlier working groups established under the auspices of this subcommittee and its parent body, such as the Working Group on Remote-Sensing and Working Group on Direct Broadcasting by Satellites. It would be charged with a careful study of relevant aspects of the use of nuclear-power sources in outer space, with a view to making recommendations for action by member states. This working group would, of course, depend on the full support and active participation of all members concerned with this technology. It could make a major contribution to the clarification of the issues, as did its predecessors in other areas of study, thus preparing the ground for constructive action in the Legal Subcommittee, the parent committee and the General Assembly. At the same time as the working group is broadening our base of scientific and technical information, discussion of legal and other aspects could proceed in tandem.

The following are some of the questions and issues to which the proposed working group should address itself. What alternatives are available as power sources for satellites and what are their relative advantages and disadvantages, including safety considerations? As amongst various nuclear-power sources, such as reactors using uranium 235 and radioisotope generators using plutonium 238, what are the relative advantages and disadvantages, including safety considerations? Should certain standards of radiation levels be established for space objects returning to earth? As a related question, should restrictions be placed on use of nuclear-power sources in relation to altitude and lifetime of orbit and decay-time (half-life) of radioactive material? What special precautions should be taken so as to rule out any possibility of uncontrolled fission reaction or explosion on aborted launch or after re-entry? What special safeguards or design standards should be developed regarding dispersal of radioactive material on re-entry or, alternatively, regarding intact re-entry and recovery? What measures are appropriate and feasible so as to provide notification of: (a) intention to launch spacecraft with a nuclear-energy source on board; (b) risk due to re-entry; (c) probable time and place of impact; and, (d) actual impact? What role could be played by other UN organizations, such as IAEA and UNDRO, so as to enhance the level of safety of operations of such satellites and adequate international emergency-response operations, if needed, for search, recovery and clean-up?

Other delegations may well have other questions to put to the working group, and we offer these questions only as a preliminary indication of areas where we believe that technical studies should be pursued.

I do not wish to raise here legal matters that should appropriately be dealt with in the Legal Subcommittee meeting in Geneva next month. However, I should make clear our intention to call for parallel studies of legal implications of this matter, as part of a phased and comprehensive response. We have in mind proposing, in particular, a review of the existing international instruments adopted by the Outer Space Committee in earlier years to determine whether there is a need for elaboration of an additional instrument governing the use of nuclear-power sources in outer space, either in the form of guiding principles for adoption by the General Assembly or of a convention containing binding legal obligations. Taking into account all technical and

other factors, there may be a need, for example, to establish the equivalent of a nuclear-free zone in near-earth orbit. The proposed working group on scientific and technical aspects of this matter would help lay the foundation for constructive and realistic discussion in the Legal Subcommittee and in the General Assembly.

We look to other members of this subcommittee to join with us in an effective response to the issues raised, along the lines I have described. We welcome the views of others and we are flexible on specific proposals, while strongly committed, with other nations, to the need for a regime governing the use of nuclear-power sources in outer space that will rule out the risk of any incident that could have tragic and farreaching consequences.

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