COSMOS 954 AND THE SPACE TREATIES+

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In one of the most spectacular accidents of the space age a five-ton Soviet surveillance satellite with an atomic power-plant abroad burned up in the atmosphere over the remote reaches of Canada's Northwest territory on January 4, 1978.[1] The 110 pounds of uranium that fueled the power-plant—and the radioactive strontium, cesium, and iodine that were the fission products of the uranium—burned with the satellite in the atmosphere and were scattered to Earth. The Soviet spacecraft began its plunge into the atmosphere at 6:50 a.m. Eastern Standard Time over Queen Charlotte Island off the west coast of Canada. It disintegrated three minutes later into countless fireballs over Great Slave Lake, near the mining towns of Yellow Knife, Fort Radium, and Uranium City.

The Canadians immediately sent out search parties to look for debris. In the United States, the U. S. Air Force dispatched an instrumented KC135 jet from McClellan Air Force Base and a high flying U-2 aircraft from Beale Air Force Base to sample the air over Western Canada. The planes carried filters to trap radioactive fallout from the upper atmosphere. Later, these filters were analyzed for radioactive isotopes like strontium-90, cesium-137, and iodine-131 that are fission products of any nuclear chain reaction.

The Soviet satellite was described by the White House and Congressional sources as "an ocean-surveillance satellite" that uses radar to locate warships of the United States Navy in the major oceans. This satellite was the first of 16 ocean-surveillance satellites to meet with an accident in the last six years.

The satellite which was called Cosmos 954 by the Soviet Union was launched from its Cosmodrome near Tyura Tam on September 18, 1977. It had followed into orbit a sister satellite known as Cosmos 952 which left the Cosmodrome two days before on September 16. Both satellites had been flying 150 miles above the Earth in a northeasterly direction following a path that took them roughly over two-thirds of the Earth every two weeks. Their surveillance covered an area from the edge of the Antarctic in the southern hemisphere to the edge of the Arctic in the northern hemisphere.

On December 25, 1977, Cosmos 952 was fired out of its 150-mile orbit and raised to where it circled the earth at an altitude of more than 600 miles, where it is no longer

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[1] This event has been reported in the press all over the world and references to it would be much too numerous to cite in the ensuing factual summary.

operational. The same maneuver had been performed on 14 earlier surveillance satellites to take them and their atomic reactors far enough from Earth to keep them in space for hundreds of years. According to accounts, in the six years the Soviets have had their ocean-watching satellites in space, they have always had two on patrol at the same time. The longest any has stayed in the 150-mile orbit has been 74 days. Generally they stay in orbit no more than two months before being lifted to the higher orbit making them no longer operational.

A few days after Christmas the same orbit-raising maneuver was tried on Cosmos 954. The satellite failed to go into the higher orbit forcing the five-ton spacecraft into a tumble that brought the satellite out of orbit. The Soviet News Agency, TASS, said the satellite was sharply depressurized for reasons yet unknown on January 6 this year, with the result that the satellite began to come down in an unplanned regimen. This would suggest that the satellite fuel tank had been exhausted either by a leak or some kind of explosion that did not allow the satellite's engines to fire. The leak or explosion could have given the satellite a downward thrust that took it out of orbit. At this time the North American Air Defense Command in Colorado Springs began to notice that the Cosmos 954 was in trouble. Radars operated by NORAD saw the Soviet satellite fall from 150 miles to 100 miles in 10 days at which time warnings were flashed to countries which lay below the satellite's route.

It has been generally known that the Soviet's ocean-surveillance satellites obtain their power from nuclear reactors. Accounts of the accident indicate that the reactors hold 110 pounds of highly enriched uranium which is the same kind of fuel used in atomic submarines and the same type of uranium used to make nuclear bombs. That amount of uranium produces 100 kilowatts of electricity. This is enough to power an active radar system that could penetrate clouds to identify surface ships. It could distinguish between targets such as an aircraft carrier or a surfacing nuclear submarine.

The satellite's nuclear power-plant, according to accounts, was turned on shortly after the satellite left the Earth last September. It was kept on at least until December 25 when it was due to be taken into a higher orbit. If that is the case, the satellite's reactor would have produced about 100,000 curies of fission products like strontium-90 and cesium-137. These are poisonous wastes of nuclear power. These wastes were either burned up with the satellite over Western Canada at such high altitudes that they were taken by upper air winds and carried all over the globe where they may stay for years to come or they settled down toward Earth with rain and snow which brought them to rest on Western Canada.

The fission product called iodine-131 is the first one that is looked for in the fallout of an atmospheric bomb test. The significance of this is that the iodine settles in pasture grass and then is lodged in the thyroid glands of cattle eating the grass. The milk of cows which have grazed on such contaminated grass has often been destroyed after an atomspheric bomb test.

Cosmos 954 was not the first satellite with atomic fuel abroad which has met with a mishap. The United States has had three accidents involving nuclear fuel satellites, only one of which involved the burn-up of radioactive debris. That incident took place in 1964 when a Navy transit satellite burned up in the atmosphere unloading 17,000 curies of radioactive plutonium into the upper air. The plutonium had been used as a heat source by the satellite.

Since then two other satellites with radioactive heat sources have plunged back into the water along with pieces of the satellite that took them away from Earth. Both were recovered intact by Navy frogmen. One was the radioactive source aboard the Apollo-13 spacecraft that was aborted. The other was aboard a Nimbus weather satellite that failed to go into orbit and fell into the Santa Barbara Channel off the coast of California.

The Canadian Defense Minister, Barney Danson, said the debris from the Soviet nuclear-powered surveillance satellite was pinpointed near Baker Lake, a remote outpost in the frozen tundra of North-central Canada less than 100 miles south of the Arctic Circle. The entire uranium core of the Soviet satellite contained at least 1,000,000 curies of alpha, beta, and gamma radiation. One million curies of radiation would be roughly equivalent to the radiation in a small atomic explosion, somewhat smaller than that caused by the bomb detonated in 1945 at Hiroshima. The source of the radiation is not the 110 pounds of uranium in the power-plant, but the radioactive fission products like strontium-90 and cesium-137 that have built up as uranium fuel burned itself up. There is also a small amount of plutonium in the spent fuel as well.

Having summarized the events surrounding the crash of Cosmos 954, much of which has been reported all over the world, the question arises: how do the outer space treaties come into play? The Outer Space Treaty of 1967[2] in Article VII provides that the States which are parties to the agreement shall be internationally liable for any damages caused by a space object. A State which launches such a space object is liable for its consequences.

Paragraph 1 of Article 5 of the Agreement on the Rescue and Return of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space[3] imposes a duty on a Contracting Party to notify the launching authority and the Secretary General when it discovers that a space object or its component parts has come down in its territory. In the case of the Cosmos 954, the Canadians did so inform the Soviet Union.

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[2]The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (hereinafter referred to as the Outer Space Treaty) was signed on January 27, 1967 and entered into force October 10, 1967 , [1967] 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205.

[3]Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, April 22, 1968, [1968] 19 U.S.T. 7570, T.I.A.S. No. 6599, 672 U.N.T.S. 119 (hereinafter cited as Rescue and Return Agreement or Rescue Agreement).

Paragraph 4 of that Article 5 provides that if a Contracting Party has reason to believe that a space object or a component part which it discovers is hazardous or deleterious it may request the launching party to take immediate and effective steps to eliminate any possible harm or danger. The launching party may be required to remove the entire object, for example, if removal from the territory of the Contracting Party is the only way in which the danger can be eliminated.[4]

The Canadians did not request the Soviets to take any steps to assist or to eliminate the possible danger or harm. In fact, it is my understanding that the Canadians refused the assistance proferred by the Soviet Union in this regard.

Paragraph 5 of Article 5 provides for payment by the launching authority of expenses incurred by a Contracting Party in recovering and returning a space object or component part, if requested by the launching party.

The Treaty states that the expenses arising in connection with the recovery and return of space objects and their components "shall be borne" by the launching authority. Such an obligation is understandable since the benefit from the recovery and return may be in the millions of dollars. (It is to be noted that the Agreement speaks of "expenses" and not "reimbursement." This was deliberate on the part of the drafters since it was felt that negotiations would take place prior to any steps to recover or return the object or its component parts.) Since the expenses incurred by the Contracting Party must be borne by the launching state, a launching authority's request for such recovery and return is a condition of this obligation.

It is my understanding that the Soviet Union did not request the recovery or the return of Cosmos 954 or of any of its components.

In 1972 the Convention on International Liability For Damage Caused by Space Objects was opened for signature.[5] This agreement codified Article VII of the Outer Space Treaty. The parties involved in the Cosmos 954 accident were the Soviet Union and Canada both of whom have signed the Liability Convention and therefore are bound by its provisions. That Convention says "A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth. . ."[6] and defines "damage" as meaning "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons. . ."[7]

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[4]See Dembling and Arons, The Treaty on Rescue and Return of Astronauts and Space Objects, 9 Wm. & Mary L. Rev. 630, 656 (1968).

[5]Convention on International Liability for Damage Caused by Space Objects, March 29, 1972, [1972] 24 U.S.T. 2389, T.I.A.S. No. 7762 (hereinafter cited as Liability Convention).

[6]Art. II.

[7]Art. I.

The question arises as to whether Cosmos 954 caused damage as defined by the Convention. Interpreting the definition strictly, an argument may be made out that there was no such damage since there was no loss of life, no personal injuries involved, or other impairment of health. However, it could be argued that the radiation did result in damage to Canadian property and therefore the Soviet Union is liable.

It is not clear what precautionary measures taken by a contracting state are covered under the Convention. However, such actions which may be taken may mitigate eventual resulting damage and perhaps should be considered.[8]

While the Liability Convention provides for exoneration from absolute liability "to the extent that a launching State establishes that the damage has resulted either wholly or partially from gross negligence or from an act or omission done with the intent to cause damage on the part of the claimant State, or of natural or juridical persons it represents"[9] that does not appear to be the case here. It does not appear that Canada did anything with regard to this accident which would exonerate the Soviet Union from its liability. The Convention also provides that "a State that suffers damage. . .may present to a launching State a claim for compensation for such damage."[10] Canada under the Convention therefore may present such a claim to the Soviet Union. The claim must be presented through diplomatic channels[11] not later than one year following the date of the occurrence of the damage.[12] While the relevant article provides a one-year time limit,[13] it also privdes that if the full extent of the damage is not known, the claimant State is entitled to revise the claim and submit additional documentation "until one year after the full extent of the damage is known" or "in no event [to] exceed one year following the date on which the State could reasonably be expected to have learned of the facts through the exercise of due diligence."[14] The Convention also provides that the launching State shall be liable to pay damages so that the claimant will be restored to the condition which existed if the damage had not occurred[15] and that the compensation will be in the currency of the claimant State.[16]

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[8]Also, there are other treaties or conventions which may cover the situation, *e.g.*, the Vienna Convention on Nuclear Liability; however, their discussion is not within the scope of the presentation.

[9]Art. VI.

[10]Art. VIII.

[11]Art. IX.

[12]Art. X.

[13]Art. X, Para. 1.

[14]Art. X, Paras. 2 and 3.

[15]Art. XII.

[16]Art. XIII.

Canada and the Soviet Union have one year in which to settle the claim after Canada files its claim. If no settlement is made, a Claims Commission would be established at the request of either party.[17] The Convention goes on to specify that the Claims Commission will be composed of three members, one each appointed by the claimant State and the launching State, and the third member who will serve as chairman, to be chosen by the parties jointly. If no agreement is reached on the choice of the chairman within four months of the request for the establishment of the Commission, then either party may request the Secretary-General of the United Nations to appoint the chairman. He has a further period of two months in which to do so. [18] The Claims Commission would then decide the merits of the claim for compensation and determine the amount of compensation payable, if any.[19] The decision of the Commission is final and binding if the parties have so agreed. If the parties have not so agreed, the Commission will render its recommendations which the parties shall consider in good faith.[20] This decision will be made public.[21] The drafters of the Convention hoped that the public disclosure of the recommendations of the Commission would serve as pressure on the parties to accept the Commission's findings and determinations.

It may be recalled that the President of the United States offered to the Canadians assistance in locating the debris and to aid in the determination of any of the radioactive fallout. This assistance was accepted by the Canadians. Similarly, the Soviets also offered to render the Canadians assistance in this area. As stated previously, it appears that the Canadians refused this offer.

Another article of the Liability Convention provides that "if the damage caused by a space object presents a large scale danger to human life or seriously interferes with the living conditions of the population or the functioning of vital centers, the States parties and, in particular the launching State, shall examine the possibility of rendering appropriate and rapid assistance to the State which has suffered the damage when it so requests."[22] In this case the Canadians chose to accept the United States offer and turned down the offer of assistance from the launching State, the Soviet Union. The fact that the Canadians turned down the offer from the launching State does not excuse the Soviet Union from liability for the damages which the claimant sustains. Compensation could also be claimed if any radioactive substances were given off and caused injury to

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[17]Art. XIV.

[18]Art. XV.

[19]Art. XVIII.

[20]Art. XIX, Para. 2.

[21]Art. XIX, Para. 4.

[22]Art. XXI.

personnel or damage to the ground. Although the Department of State, through its spokesperson, stated that early tests showed no indication of any radioactivity, it is presumed that the Canadians will wait to see what the eventual damages are in order to submit their claim. There again, the Convention provides that the claimant State "has one year following the date on which it could reasonably be expected to have learned of the facts through the exercise of due diligence."[23] It is believed that though early indications were that there was no radioactivity, later tests have shown the situation to be contrary.

The question of depletion of the Earth's ozone layer has also been raised. There have been no determinations made under the Liability Convention or the Outer Space Treaty with regard to this kind of damage and there is no general agreement that damage under Article II of the Liability Convention embraces the kind of damages caused by ozone depletion. According to the State Department, ozone depletion was not the type of damage contemplated by the drafters of the Liability Convention.[24] The type of damage caused by depletion of the ozone layer is inconsequential in nature as opposed to direct or approximate to come within the scope of the Convention's coverage according to the State Department.[25] Since ozone depletion would probably not be permanent in any one spot, it would be difficult to prove that a particular incident depleted the ozone layer to such an extent as to cause damage on the Earth's surface. It is noted that the difficulty of attributing liability to States for damages resulting from some specified event is a well recognized problem in international law. When dealing with such problems, international tribunals usually speak of "proximate cause" and tend to disallow damages which are "remote," "speculative," or not proximately caused by the specific event in question. Whatever particular damages will be allowed depends on the particular circumstances of each case.[26]

Article XII of the Liability Convention provides that compensation for damages under the Convention must be determined "in accordance with international law and the principles of justice and equity." In this regard, it has been recognized that where a State's conduct of activity, though lawful *per se*, entails environmental effects in the territory of another state, the affected State is entitled to compensation where there is clear and convincing proof of material damage.[27]

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[23]Art. X.

[24]This communication was received by the author from the Office of Legal Adviser on Treaty Affairs in the Department of State.

[25] *Ibid.*

[26]See W. Friedman, International Law 846 (1969); 3 Whiteman, Damages in International Law 1765-1767 (1943), and Restatement (Second) of Torts §§ 430 and 431.

[27]See the Trail Smelter Arbitral decision (*United States v. Canada*), 35 Am. J. Int'l L. 684 (1941).

The *Trail Smelter* case stated that clear and convincing proof of material damage is a precondition of the polluting State's liability to the affected State. In this respect various authorities have pointed out that the limited amount of space activity by States has not provided a sufficient basis for determining the conditions which would impose liability for any such resulting pollution.[28]

It is clear that any rights and obligations arising under the Liability Convention from pollution of the Earth's atmosphere by chemical emissions from the space object would have to be determined based on an assessment of the specific facts which must include findings concerning the existence of material damage. Verifiable scientific data is needed as evidence of any such material damage to the Earth's environment and the acquisition of such data by the claimant State.

[28]See 69 Am. J. Int'l L. 50, 69 (1975); 4 J. Space L. 23, 30-31 (1976).