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ABSTRACT

Two international diplomats from the Soviet Union and the United States focus on the need for a treaty to ban the use of radiological weapons. Radiological weapons are those based on the natural decay of nuclear material such as waste from military or civilian nuclear reactors. Such devices include both weapons and equipment, other than a nuclear explosive, designed to cause destruction or injury by dissemination of radioactive material. They are generally considered one of many so-called "weapons of mass destruction." As yet undeveloped, radiological weapons have been the subject of investigation both in the Soviet Union and in the United States and could conceivably be perfected for military use in the future. It was with this possibility in mind that the United States and the Soviet Union proposed in 1979 a joint draft of a Radiological Weapons Treaty to the Geneva-based Committee on Disarmament. A Radiological Weapons Treaty would be a modest achievement at best. However, under the current circumstances of heightened cold war rhetoric and mushrooming military budgets of the two superpowers even a modest agreement to ban a potentially highly destructive new weapons system assumes an added significance. It suggests the two major nuclear-weapon states have concluded that arms limitation progress must proceed and that more substantive agreements may be possible in the future. (Author/RM)

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Radiological Weapons Control: A Soviet and US Perspective

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Victor L. Issraelyan was born in Tbilisi in the Caucasus of the Soviet Union and was educated as a physician. His personal desire for world peace led him to a second profession in political science.

After his graduation, Dr Issraelyan became Director of the Political Science Department of the Academy of Diplomacy in Moscow. He researched and taught international relations, and he authored several books on disarmament issues, the diplomacy of World War II, international affairs, and Soviet foreign policy.

In 1968 Ambassador Issraelyan began diplomatic work with assignments including First Deputy Representative of the USSR to the United Nations and Director of the Department of International Organization of the Soviet Ministry of Foreign Affairs, in addition to numerous bilateral and multilateral negotiations and conferences on disarmament issues. Currently he is a Member of the Collegium of the Ministry of Foreign Affairs and USSR Representative to the Committee on Disarmament in Geneva.

Charles C. Flowerree served as US Representative to the Committee on Disarmament in Geneva during 1980 and 1981. Concurrently he headed the US delegation to the 1980 Review Conference of the Biological Weapons Convention held in Geneva and served as Alternate Head of the US delegation to the 1980 Review Conference of the Treaty on Non-Proliferation of Nuclear Weapons.

Ambassador Flowerree, a graduate of the United States Naval Academy, joined the Department of State in 1958 and was appointed to the Foreign Service in 1962. Numerous assignments followed both in Washington and abroad. In 1977 he was named Chief of the International Relations Division of the US Arms Control and Disarmament Agency where he supervised all multilateral arms control efforts. In that capacity he participated in UN General Assembly debates and in bilateral arms control negotiations. He is now a senior advisor in the Arms Control and Disarmament Agency.

Radiological Weapons Control
A Soviet and US Perspective

Controlling Radiological Weapons A Historical Overview

by Charles C. Flowerree

For most of the period since the dawn of the nuclear era, radiological warfare has not been high on the list of public concerns about future conflicts. Immediately after World War II, however, the use of weapons based on the natural decay of radioactive material to cause destruction, damage, or injury on a massive scale was considered to be a threat nearly comparable to that posed by atomic weapons. Subsequently, the concern about "radiological material weapons" receded to virtual invisibility. Today, with the further passage of time and the accumulation of enormous quantities of radioactive waste material, interest in controlling the use of this material as a weapon of war has again stirred, albeit modestly.

In 1948 the United Nations produced a definition of weapons of mass destruction which gave prominence to radioactive material weapons. That definition reads as follows:

> Weapons of mass destruction should be defined to include atomic explosive weapons, radioactive material weapons, lethal chemical and biological weapons, and any weapons developed in the future which have characteristics comparable in destructive effect to those of the atomic bomb or other weapons mentioned above.[1]

In the immediate postwar period the United States considered it prudent to investigate the possibilities of radiological weapons, but no operational capability was developed.

Although skeptics have questioned the feasibility of radiological weapons, situations have arisen in which their potential had attractions. For instance, during the 1950s and early 1960s when radioactive material was in

1 UN Document S/C 3/32/Rev 1, as cited in *The United Nations and Disarmament 1945-1970* (United Nations Publication, Sales No 70 IX 1), p 28

relatively short supply, there were, nevertheless, brief flickers of interest in radiological weapons by the operating arms of US military forces. One example is General Douglas MacArthur's proposal for ending the Korean conflict sent to the Joint Chiefs of Staff on February 11, 1951 The main elements were:

> First he would "clear the enemy rear all across the top of North Korea by massive air attacks." Next, "If I were still not permitted to attack the massed enemy reinforcements across the Yalu, or to destroy its bridges, I would sever Korea from Manchuria by laying a field of *radioactive wastes the by-products of atomic manufacture across all the major lines of enemy supply*." Finally, "I would make simultaneous amphibious and airborne landings at the upper end of both coasts of North Korea, and close a gigantic trap. . . ."[2]

In the early 1960s, brief consideration was given at the military staff level to using radioactive material to stop North Vietnamese infiltration into South Vietnam. Neither this idea nor that of General MacArthur was translated into action. No circumstances apparently have arisen in recent years to stimulate similar proposals.

Early efforts to address the problem of radiological warfare were few and sporadic. The revised Soviet plan of 1962 for general and complete disarmament made brief reference to radiological weapons Five years later, in the UN General Assembly, Malta introduced a resolution calling for the negotiation of an agreement banning chemical, bacteriological, and radiological weapons, but in its final form this resolution dropped the radiological weapons component. In August 1968, in an intervention in the Eighteen Nation Disarmament Committee (ENDC), the Burmese representative raised the radiological weapons question with the intention of reminding the international community that such weapons should not be overlooked in the overall arms control effort

At the next year's General Assembly, Malta again introduced a resolution on radiological weapons. This

2 William Manchester, *American Caesar Douglas MacArthur 1880-1964* (Boston Little, Brown and Company, 1978), p 627 Italics added

time it was adopted The resolution, dated December 9, 1969, called for the Conference of the Committee on Disarmament (successor to the ENDC) to consider effective methods of control against the use of radiological warfare.

At the Conference of the Committee on Disarmament (CCD) the following summer the Netherlands introduced a working paper on radiological weapons dated July 14, 1970, which concluded that since the possibilities of radiological weapons did not seem too significant, it was difficult to see the utility of discussing arms control measures relating to them. However, the Soviet delegation thought that before deciding to ignore this problem, the Committee should have further information on the scientific and technological aspects.

Over the next few years, the US government began to consider the implications for radiological weapons due to the accumulation of even greater quantities of radioactive waste materials from the burgeoning nuclear power programs of countries around the world. This effort culminated in a proposal put before the 31st UN General Assembly by the United States on November 18, 1976. The essence of the US proposal was spelled out in a speech by Fred Ikle, then director of the US Arms Control and Disarmament Agency:

> My government suggests that next year an appropriate forum, such as the CCD, consider an agreement that would prohibit the use of radioactive materials as radiological weapons. Such an agreement would not affect the production of radioactive materials, either as a necessary by-product of power reactors or for other peaceful applications, or affect our call for storage of spent fuel under international auspices.
>
> Such an agreement could complement the Geneva Protocol of 1925, which prohibits the use of poison gas and bacteriological methods of warfare. In addition, a radiological warfare agreement could contain a provision for appropriate measures by the parties to preclude diversion of radioactive materials for use as radiological weapons.[3]

3 A speech by Fred Ikle before the First Committee of the UN General Assembly, Nov 18, 1976

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The US initiative was based on the fundamental concern that with the spread of nuclear technology and materials a growing number of states would have at hand increasing quantities of radioactive materials, although for the foreseeable future the vast preponderance of radioactive materials would be held by the major nuclear industrial powers. The increased availability of radioactive materials made the problem of their possible use of more practical importance than in earlier years. In putting forward this proposal the United States made it clear in informal discussions that it did not wish to impede work on other issues currently before the CCD.

This theme was echoed by the US delegation when the Committee met for its spring session in 1977. On March 17, the US representative included the following statement in his remarks:

> I must say here that the U.S. Delegation believes that it may be appropriate for the CCD to give further attention to dealing with this specific subject of radiological weapons, which we agree by definition is a weapon of mass destruction, at some time consistent with the CCD's work program.[4]

To the extent that radiological weapons had been treated at all in the CCD up to that time it had been in the context of discussions of the Soviet proposal for a convention banning new types of mass destruction weapons. The United States opposed a generalized convention on the grounds that each weapon dealt with in an arms control agreement posed its own special problems, particularly in regard to methods of verification, and no weapon could be successfully prohibited in the absence of knowledge of its characteristics. The United States acknowledged that radiological weapons constituted an identifiable type of mass destruction weapon that had not been addressed in arms control negotiations and held that any prohibition on them should be considered in this context.

When Secretary of State Vance visited Moscow for arms control talks in March 1977, shortly after the Carter administration took office, weapons of mass destruc-

4 Proceedings of the CCD, March 17, 1977

tion were among the topics discussed. Although there were differences of view on this subject, in the end the Soviet side agreed to a compromise which called for the establishment of a joint working group (one of several agreed to at that time) charged with considering possible limitations on radiological weapons as an aspect of the question of banning new types of mass destruction weapons.

The two sides lost little time in activating the radiological weapons bilateral working group. A preliminary meeting was held in Geneva in May 1977 under the leadership of the CCD representatives of the United States and the Soviet Union, and two more substantive meetings were held before the end of the year. Their objective was to prepare a joint initiative to be submitted to the CCD which would become the basis for a multilateral convention. Early in the discussions, the Soviet side made known that it was prepared to go beyond a simple "nonuse" agreement to an agreement that would ban the development, production, and stockpiling as well as the use of weapons that cause damage or injury from the decay of radioactive material. The United States agreed to proceed along this line.

Over the next two years of negotiations, agreement was reached on a joint initiative in the form of draft elements of a treaty banning radiological weapons. In the meantime, at the Vienna Summit in June 1979, a pledge by the leaders of the United States and the Soviet Union to work for the achievement of a radiological weapons convention was included in the final communique.

Shortly afterwards, on July 9, 1979, the joint US-Soviet initiative was completed and submitted to the Committee on Disarmament (CD), the successor body to the CCD. The Committee took no immediate action although the initiative was generally welcomed. Many delegations said they would need more time than was available before the end of the session to study the text and to get expert views from their capitals.

The joint initiative followed in many respects the model of the Environmental Modification Convention of 1977 which also dealt with possible methods of waging war-

fare that had not yet been tried in combat The draft treaty elements included an undertaking not to develop, produce, stockpile, or otherwise acquire radiological weapons The definition of radiological weapons specifically excluded radioactive material produced by a nuclear explosive device An important element was a provision for the establishment of a Consultative Committee of Experts which would be convened by the depositary within a month of the receipt of a request from any state party This committee would act as a fact-finding body but would not render judgments on treaty violations It would assist parties in their obligation to consult one another and to cooperate in solving problems which might arise in relation to the objectives of the treaty or in the application of its provisions

The concept of a consultative committee first appeared in a multilateral arms limitation agreement in the Environmental Modification Convention It represented an advance over the provisions of the earlier Seabed Arms Control Treaty and the Biological Weapons Convention in terms of a better mechanism for consultation among parties on questions of compliance and as a means of improving the climate of confidence among the parties

When the CD convened for its 1980 session one of its first acts was to establish a working group on radiological weapons under the chairmanship of Ambassador Imre Komives of Hungary The working group began an intensive examination of the joint US-Soviet text and made a variety of suggestions for changes Among the changes were proposals for adding new elements such as a provision that states parties with developed nuclear industries would commit themselves to aid the less developed countries in research and development related to radioactive isotopes and other materials

The most contentious issues proved to be (1) the definition of radiological weapons, and (2) the question of whether attacks on peaceful nuclear facilities, such as nuclear power stations, constituted radiological warfare and should be banned by the convention These issues remained unresolved through both the 1980 and 1981 sessions with the question of attacks on nuclear facilities, which had originally been raised by Sweden in

1980, gaining more immediacy after the destruction of the Tamuz reactor in Iraq by Israeli warplanes in early June 1981.

The definition problem, which had been one of the most difficult issues in the US-Soviet negotiations, also proved to be troublesome to the CD. The US-Soviet draft covered both the production and retention of weaponized radiological material and any use of radioactive material, even though not in weapon form, to cause death, damage or injury, except for nuclear weapons and material produced by nuclear explosions. Some delegations had difficulty with the concept of defining a weapon that had not yet been developed for military use. There was also concern among some over the question of how to exclude radiation caused by nuclear explosive devices without seeming tacitly to endorse the use of nuclear weapons As of the end of the 1981 session of the CD these problems had not been resolved.

The question of banning attacks on peaceful nuclear facilities raised several vexing problems. On the technical side there was the question of whether such attacks could be construed as a form of radiological warfare. This would be particularly true if nuclear weapons were used in the attack, the fallout from the reactor itself would be of little consequence compared to that from the weapon.

A related issue was whether a convention banning radiological weapons was the most appropriate instrument for prohibiting attacks on nuclear facilities with conventional weapons for the purpose of releasing radioactivity Proponents saw no inconsistencies in such an approach, maintaining that the convention should deal with all forms of radiological warfare. Some delegations, while sympathetic to the concerns of the proponents, thought that the issue should be dealt with separately in a law-of-war context. Article 56 of the 1977 Additional Protocol I to the Geneva Conventions of August 12, 1949, dealing with the laws of war addresses the question of attacks on facilities containing "dangerous forces" and specifically places restrictions on attacks on electrical generating facilities.

The United States was among those who argued that Additional Protocol I already provided broad protection to peaceful nuclear facilities. Article 56, if read in conjunction with Article 51 which prohibits making the civilian population the object of an attack and prohibits indiscriminate attacks, appears to be relevant For example, attacking a facility for the purpose of causing general contamination of an area would be prohibited if civilian populations were located in the vicinity since the distribution of radioactive fallout could not be controlled by the attacker but would depend on unpredictable wind patterns

Other articles of the protocol:

1. Require that attacks be limited to "military objectives," for example, those that make an effective contribution to military action and whose destruction or neutralization offer a definite military advantage

2 Prohibit any attack that may be expected to cause incidental death or injury to civilians which would be excessive in relation to the concrete and direct military advantage anticipated.

3 Prohibit the use of methods or means of warfare which are intended or may be expected to cause widespread, long-term, and severe damage to the natural environment and thereby to prejudice the health or survival of the population.

If further, more specific restrictions are thought desirable, Article 56(6) provides for the possibility of new agreements among the high contracting parties to Protocol I, or the parties to a particular conflict, to provide for additional protection for objects containing dangerous forces.

While these features of Protocol I to the 1949 Geneva Convention were generally recognized by members of the CD as being relevant, certain delegations insisted that the problems be dealt with in the context of a radiological weapons convention which otherwise, they contended, would have no meaning. This question, too, remained unresolved through the end of the CD's 1981 session.

Some of the other issues that arose during the debates on a radiological weapons convention included the requirements for national implementing legislation, the relationship of the proposed convention to the International Atomic Energy Agency agreement on the protection of nuclear material, and, as has been mentioned, the responsibility of developed states to assist developing countries in their radioactive materials programs. The fundamental obstacle to rapid progress, however, appeared to be a belief on the part of many that while a radiological weapons convention was desirable, it was not of great importance and the CD should turn its attention first to higher priority nuclear disarmament questions, such as a comprehensive test ban.

The US delegation shared the view that a radiological weapons convention would be no more than a modest achievement, but argued that it would, in addition to its intrinsic value, have important implications of a less tangible nature. It would deal with the only weapon in the 1948 definition of mass destruction weapons concerning which the international community has thus far made no effort to restrain. It would choke off the development of a weapon of mass destruction at a time when it could be dealt with most easily, that is, before operational development, and before the availability of radioactive waste becomes even more widespread. Completion of the convention would represent the first multilateral agreement of any sort curbing the employment of nuclear energy in war. Finally, completion of such an agreement would enable the CD to gain valuable experience and test its procedures for negotiating even more controversial agreements in the future.

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Radiological Weapons Possible New Types of Weapons of Mass Destruction

by Victor L. Issraelyan

The problem of employing radioactive materials as a radiological weapon is not novel. The possibility of such a use of radioactive materials was first mentioned in various publications shortly after the end of World War II As early as 1948 the UN Commission for Conventional Armaments, having analyzed the results of the use by the United States of atomic bombs in Hiroshima and Nagasaki, classified a weapon "employing radioactive substances" as a weapon of mass destruction.

The most complete definition of radiological weapons is given by the Soviet-US draft treaty on the prohibition of the development, production, stockpiling, and use of radiological weapons submitted to the Committee on Disarmament (CD) for its consideration. According to this definition, radiological weapons include:

1. Any device, including any weapons or equipment, other than a nuclear explosive device, specifically designed to employ radioactive material by disseminating it to cause destruction, damage or injury by means of the radiation produced by the decay of such material.

2. Any radioactive material, other than that produced by a nuclear explosive device, specifically designed for employment, by its dissemination, to cause destruction, damage or injury by means of the radiation produced by the decay of such material.[1]

The inference to be drawn from the above definition is that the destructive factor in this type of weapon is the radiation produced by the decay of radioactive material.

At present the mechanism of radiation impact on biological structures is well known. The radiation, pene-

1 Soviet-US draft treaty, submitted to the Committee on Disarmament on 10 July 1979 by the representative of the USSR as document CD/31

trating into tissues and ionizing the atoms of their molecules, destroys the cellular structure of the tissues. The biological effects of radiation on a human organism vary considerably from one person to another and depend on age, health, etc For this reason, it is virtually impossible to determine precise radiation levels at which particular symptoms of radiation sickness begin. It is well known from clinical observations that when the entire human body is exposed to 500 to 600 or more rem in an interval of one or two days survival is almost impossible [2] If the dose is between 200 and 450 rem, survival is possible but by no means assured, even if systematic clinical treatment is available All things considered, it is usually assumed that a dose of 400 rem a day will be fatal for 50 percent of the population.

However, even relatively low radiation doses pose a tremendous threat This is related, in particular, to the destruction of the genetic mechanism, one of the human components most sensitive to radiation For this reason, the main trend in the protection of population from radiation is to prevent any danger of exposure. This lays the groundwork for the radiation protection of industrial, medical, and other possible sources of radiation. All necessary measures are envisaged to prevent an uncontrollable release of radioactive materials from nuclear facilities.

Even when it is impossible to preclude completely the effects of radiation on a human organism, as is the case with people working with radioactive materials, every measure is taken to reduce the acceptable dose of exposure by means of special individual medical controls. Many categories of people, especially pregnant women, are not allowed to work with radioactive materials. If and when an exposure dose exceeds the normal level, a whole range of preventive and therapeutic measures are taken.

It is understandable that it is hardly feasible to take similar measures with regard to large segments of population which could be exposed to radiation in unusual circumstances, even more so in case of war. Thus, the

2 Roentgen equivalent in man (rem) is the standard unit for measuring the quantity of radiation absorbed by a given mass

permissible dose for population approximates the natural background radiation. For example, the maximum acceptable dose recommended by the US Environmental Protection Agency is only twice the natural background radiation.

Due to the rapid progress in nuclear science and technology over the last 15 to 20 years the possibility of producing radioactive material which could be employed as a radiological weapon has increased considerably. Judging by the current trends in this field this probability will grow in the future.

In fact, virtually every nuclear reactor, whatever its purpose or design, is a supplier of radioactive materials. In the first place, considerable quantities of such materials are produced in reprocessing nuclear fuel for extracting unconverted uranium and plutonium as well as some radioactive products of the fissioning of the uranium. For instance, following the reprocessing of spent nuclear fuel for every 10,000 megawatt/days of the irradiation of heat-emitting elements, about 400 liters of highly radioactive wastes are produced

According to the estimates in the world literature, by the year 2000 the total radioactivity of the fragmentation elements accumulated in the world will amount to 10^{12} curie [3] A considerable quantity of radioactive isotopes and highly active compounds can be obtained by the irradiation of nonradioactive chemical elements in a nuclear reactor or an accelerator.

In view of the fact that many countries of the world have broad nuclear energy programs, it could be easily asserted that the scale of accumulation of radioactive materials as well as possibilities of producing various radioactive isotopes in necessary quantities will continue to expand. Hence, progress in the field of nuclear energy seems to stimulate a potential danger of the appearance of radiological weapons.

The longer the question of prohibiting such weapons is postponed, the more probable becomes its use for

3 A curie is a measure of radioactivity, one curie being equivalent to 3.70×10^{10} disintegrations per second.

military purposes. Those who are reluctant to ascribe to an effective international agreement banning radiological weapons usually advance the argument that such weapons are quite impractical since in times of war a large-scale production of radioactive materials and their delivery to the battlefield are, in their view, very burdensome. It is also asserted that the need to protect one's troops from radiological effects decreases even further the possibility that such weapons would ever be used, especially given the existence of numerous other types of weapons. In particular a view is expressed that the only danger of radioactive materials not produced by a nuclear explosion lies in a deliberate demolition of nuclear facilities. Such an event would result in an uncontrollable escape into the environment of great quantities of radioactive materials.

Such a viewpoint is very shortsighted, to say the least. Indeed, I have previously referred to the tremendous piles of radioactive wastes continuously accumulated in many countries because of the implementation of nuclear energy programs. Such wastes are a mixture of diverse isotopes with continually changing composition. However, it should be borne in mind that those wastes contain about 200 radioactive isotopes of various kinds, many of which are mortally dangerous to an individual, even in minute quantities. For instance, of great danger are such radioactive isotopes as plutonium 239, iodine 131, and strontium 90, noticeable quantities of which are contained in the radioactive wastes from nuclear reactors. In particular, strontium 90 with a half life of about 28 years is deposited in the bone structure of a human body damaging the bones and the blood-producing tissues. The iodine 131 isotope with a very short half life of only 8 days is quickly accumulated in the thyroid glands causing radiation damage. As for the plutonium 239 radioactive isotope with a half life of around 25,000 years, its radiation effect lies not only in its radioactivity but also in its high toxicity.

According to available estimates, a single inhalation of only 1.5 microcurie reduces an average life expectancy by half.[4]

[4] One microcurie is one millionth of a curie

Since radiological weapons are not yet developed and have never been used on the battlefield, it is difficult to speak of their effectiveness in military terms. However, it is quite easy to conceive of several hypothetical possibilities for their use, for example, as a means for an offensive military operation on the battlefield, for deliberate long-lasting radioactive contamination of the enemy's territory, or for establishing radioactive barriers.

It is quite obvious that military requirements in each particular case can vary considerably. While in one situation it might be preferable to employ radioactive materials of high intensity with a short half life, in others only radioactive materials of medium intensity with a long half life would be used.

I have not attempted to work out military instructions for the most effective uses of radioactive materials. However, all the above leads to the inescapable conclusion that any radioactive material (various materials for various military applications) can be employed as a radiological weapon. In the meantime, just as in the past, the first and most defenseless victims of such weapons would be the civilian population.

I would like to stress once again that the development of radiological weapons would result from military or political (or both) considerations and in no way depends on specific characteristics of a radioactive material.

As for the transportation of radioactive materials to a combat area, it cannot be denied that this would be a rather difficult task. However, it appears to be far more feasible now than 20 or even 10 years ago. The experience accumulated in recent years, because of the development of nuclear energy, in packing and transporting highly radioactive materials could lay the groundwork for developing and manufacturing, for instance, special aviation bombs, artillery shells, mines, torpedoes, etc., specifically designed for the dissemination of radioactive substances contained therein by way of an explosion. This might also be accomplished through special devices or equipment for the nonexplosive dissemination of radioactive materials, in particular by dispersion in the form of liquid or solid particles.

It should be noted that the possible uses of radiological weapons are not confined to the delivery systems listed above. For instance, it is quite easy to conceive of a situation in which the adversary, using appropriate technology, would be able to contaminate with radioactive materials the frontier rivers or to employ these materials by other methods the detection of which would meet with considerable difficulties.

It is evident from the above that radiological weapons are feasible and should be classified as one of the most dangerous weapons of mass destruction. Precisely for this reason it is imperative to work out a relevant international agreement prohibiting the development, production, stockpiling, and use of such weapons.

I now wish to briefly dwell on the problem of the deliberate demolition of nuclear facilities for hostile purposes. The analysis of possible consequences of the destruction of nuclear reactors given in *Scientific American* shows that the extent of the radioactive contamination widely differs depending on what types of weapons are used for such destruction — nuclear or conventional. According to the authors of that article, an attack on a nuclear reactor in the Rhine River valley with a megaton nuclear charge could render uninhabitable a third of the territory of the Federal Republic of Germany for more than a month. The only way to exclude the probability of such catastrophic consequences of an attack on nuclear reactors, in the opinion of the authors, is to avoid all nuclear war One can hardly disagree with this statement.[5]

With regard to the destruction of nuclear reactors with conventional weapons, the above-mentioned article notes that the consequences in terms of radioactive contamination of the environment would not be greater than after a major accident with a nuclear reactor.

A major accident can undoubtedly pose a serious exposure danger for people living in the vicinity of the reactor. However, it would be wrong to compare this danger with the danger of the use of radiological weapons, as

5 Steven A Fetter and Kosta Tsipis, "Catastrophic Releases of Radioactivity," *Scientific American*, v. 244, no. 4, April 1981.

is done from time to time. Equally erroneous is the desire of some countries to tie the elaboration of international legal rules for the protection of civilian nuclear facilities against attacks to a treaty banning radiological weapons. Working out such rules is a complex independent problem. Indeed, its solution would require an accurate but now practically impossible delimitation between military and civilian facilities. Even in peacetime, for instance, electrical energy generated by nuclear power plants, as a part of vast national energy networks, is used to supply noncivilian facilities. Nuclear power plants, apart from their direct purpose, can be used for producing nuclear materials for the purposes of developing nuclear weapons.

From the international legal standpoint, a solution to the above-mentioned problem requires the resolution of a wide range of collateral questions related to its humanitarian aspects, the correlation between military necessity and morality, the principle of proportionality in attaining an equivalent military effect, and others dealt with in the agreements on the laws and customs of war. In particular, the Additional Protocol I to the Geneva Conventions of 1949 includes a special article concerning the protection of works and installations containing dangerous forces, including nuclear power plants It is noteworthy that the restriction of attacks against such power plants is not an absolute one but is accompanied by a number of qualifications.

I believe that this problem should also be viewed in terms of regulating preventive measures which should be adopted by states in peacetime as well as against an accidental release of nuclear energy (accidental explosions, nonplacement of such stations, installations in densely populated areas, etc.) which could result in widespread radiation contamination. Such release of radioactive materials can be perilous not only for the states in whose territory nuclear installations are situated but also for adjacent countries.

In view of the above difficulties the desire to resolve the problem of protection of nuclear facilities within a treaty on the prohibition of radiological weapons could bury the very idea of the treaty or, at best, postpone its elaboration for many years.

On 10 July 1979, after two years of Soviet-US negotiations, the delegations of the Soviet Union and the United States submitted an agreed joint proposal on this issue to the CD for its further consideration and discussion

The first provisions of the draft treaty define the scope and the subject of the prohibition. The obligations which the parties to the treaty would assume under those provisions entirely rule out the possibility of intentional use of any radioactive material, not produced by a nuclear explosive device, as a weapon of mass destruction Article 1 of the treaty says that "Each State Party to the Treaty undertakes not to develop, produce, stockpile, otherwise acquire or possess, or use radiological weapons "[6]

Article 2 of the treaty provides the definition of the term "radiological weapon" referred to above.[7]

Since the subject of the draft treaty is radiological weapons it does not cover nuclear explosive devices or radioactive materials produced by explosion. That is to say, the treaty is not related to nuclear explosive weapons.

Besides the above obligations, states party to the treaty must not assist, encourage, or induce any person, state, group of states, or international organization to engage in any activities prohibited under the terms of the treaty.

The parties to the treaty would also undertake, in accordance with their constitutional procedures, any measures deemed necessary to prevent loss of radioactive materials that might be used in radiological weapons and to prohibit and prevent diversion of such materials for the purposes of developing those weapons.

The prohibition of radiological weapons does not hinder in any way the use of radioactive materials for peaceful purposes, that is in various branches of technology, industry, agriculture, and medicine. One of the draft's

6 UN Document CD/31

7 See page 17

articles underlines the right of the parties to the agreement to unimpeded peaceful activities in the respective area, namely.

> Provisions of the Treaty shall not hinder the use of sources of radiation from radioactive decay for peaceful purposes and shall be without prejudice to any generally recognized principles and applicable rules of international law concerning such use

The text of the draft also provides for a procedure of withdrawal from the treaty A state should give notice of such withdrawal to all other parties and to the UN Security Council three months in advance. Such notice should include a statement of the extraordinary events it regards as having jeopardized its supreme interests.

This provision of the draft treaty is a measure to prevent possible violations of the treaty. It stresses the need to safeguard security interests of its parties and takes into account the fact that the treaty concerns a potential means of mass destruction that could take an important place in the military arsenals of states.

In this article of the treaty, the coauthors proceeded from the assumption that, as a result of scientific and technological development, in certain situations radiological weapons could be recognized as being even more effective than any other type of weapons of mass destruction. In cases when actions by the violators of the terms of the treaty jeopardize the interests of other parties, a possibility of withdrawal is envisaged. Such a provision is contained in many other arms control related agreements. For this reason, it has been incorporated in the agreed proposal.

The provision regarding verification of compliance with the treaty corresponds to the principle whereby all verification measures provided for in any treaty on the limitation of armaments should conform to the subject and scope of the prohibition. In working out this provision, use was made of the experience accumulated with regard to the agreements now in force in the field of the limitation of the arms race and of disarmament. It provides for consultation and cooperation among parties in solving any problems which may arise in relation to the

objectives of, or in applying the provisions of, the treaty Such consultation may also be undertaken within the framework of international organizations, of the United Nations in accordance with its Charter, and at the meetings of a Consultative Committee of Experts. The latter is convened by the depositary within one month of the receipt of a request from any state party

The main function of the committee is to investigate problems concerning compliance with the provisions of the treaty Having summed up its inquiry, the committee transmits to the depositary a document incorporating all information and views presented during its proceedings The depositary then distributes the document to all parties to the treaty. Any state that has signed and ratified the treaty is entitled to appoint an expert to this committee, which is chaired by the depositary or his representative Each expert may, through the chairman, request states and international organizations to supply information and assistance desirable for the accomplishment of the committee's work

The article dealing with the verification of compliance with the treaty also provides for the right of parties to lodge complaints with the UN Security Council if and when a party is believed acting in breach of the provisions of the treaty Such a complaint should include all relevant information pertaining to the case in question as well as all possible evidence supporting its validity. Furthermore, in order to ensure an effective system of verifying compliance with the treaty, each party undertakes to cooperate in carrying out any investigations which the Security Council may initiate on the basis of the complaints received Moreover, all states agree to provide assistance, in accordance with the provisions of the Charter of the United Nations, to any party which so requests For such assistance to be provided, the Security Council must decide that a particular party has been harmed or is likely to be harmed as a result of violation of the treaty

Thus, it is obvious that in elaborating the major provisions of the treaty its coauthors proceeded from a need to ensure its credibility and to make all parties confident that the new treaty will become a viable and effective

means of arms limitation. It is in this spirit that formulations were worked out regarding amendments to the treaty, conferences of states parties to review the operation of the treaty, and others. The treaty's text stipulates the right of each state party to propose amendments which enter into force after the deposit with the depositary of documents of acceptance by a majority of the states parties. The draft also envisages holding a review conference ten years or earlier after the treaty's entry into force. Such a conference should take into account any new scientific and technological developments relevant to the treaty. The treaty's text also recognizes that the agreement shall be of unlimited duration.

The joint proposal on major elements of a treaty prohibiting radiological weapons submitted in 1979 by the Soviet Union and the United States roused great interest. However, despite two years of intensive negotiations in the CD on the elaboration of a text of the treaty, the work on this matter has not yet come to an end. Major difficulties hampering its successful completion have been raised by a good many of the proposals submitted since then which go beyond the framework of the joint Soviet-US document. Of major importance among such proposals are the following:

Definition of radiological weapons

1. To omit from the Soviet-US draft an exclusion clause regarding nuclear weapons.

2. To introduce into the definition of radiological weapons the concept of "radiological warfare" which, in fact, would imply modifying the Consultative Committee of Experts' mandate and shifting the negotiations from the disarmament field to the sphere of methods of warfare and humanitarian law applicable to armed conflicts.

Scope of the prohibition

To broaden the scope of the treaty prohibition provided for in the Soviet-US draft through inclusion of an obligation to protect nuclear facilities from attack. The substance of this proposal relates to methods of warfare and humanitarian law in international conflicts.

Cooperation in peaceful uses

To add to the Soviet-US draft a relevant article providing for.

1 A right of the parties to carry out their programs for peaceful uses of nuclear energy, and a right to international cooperation in this field, including exchanges of equipment, technology, materials, etc., for peaceful uses of radioactive materials.

2. A right to use for peaceful purposes any sources of radiation from radioactive decay, without affecting any generally recognized principles and applicable rules of international law in this field.

The adoption of such a proposal could result in circumventing the Treaty on the Non-Proliferation of Nuclear Weapons in which such cooperation is made conditional upon International Atomic Energy Agency control.

Verification of compliance with the treaty

1 To omit from the joint Soviet-US document a reference to the UN Security Council as the highest body for investigation of complaints concerning violations of the treaty, and to substitute the UN General Assembly for the Security Council in this capacity.

2. To broaden and shore up the functions of a Consultative Committee of Experts by authorizing it to accept and investigate complaints and to pass judgments thereon.

3 To permit on-site verification of compliance with the treaty.

The remaining amendments to the Soviet-US draft are not of a fundamental nature.

Negotiations on working out a final text of the treaty banning radiological weapons continue.

Conclusion

There is at present a growing feeling of general concern over the deterioration of the international political climate, the escalation of military preparations of states,

and the possibility of new laps being added to the arms race, primarily the nuclear-arms race. Well-known political changes have brought about snags in arms control negotiations. A sweeping review of the positions and attitudes toward the above mentioned problems has been announced by the US government

Given these circumstances it is especially important that a treaty to prohibit radiological weapons be completed and adopted by the greatest possible number of states, something that the Soviet Union has long advocated. It must be borne in mind that agreement on the basic provisions of a treaty to ban the development, production, stockpiling, and use of radiological weapons was reached several years ago as a result of negotiations between the Soviet Union and the United States. The head of the Soviet state, L. I. Brezhnev, and the US President, J. Carter, who met in Vienna from 15 to 18 June 1979 expressed satisfaction over that fact. Consequently, the conclusion of a treaty could become a follow-up to the joint efforts of the Soviet Union and the United States to reduce war danger, and at the same time it would be a manifestation of the adherence of the two states to the idea of continuing such efforts.

The conclusion of a treaty elaborated as a result of cooperation between the two great powers could also be important from the point of view of reactivating multilateral efforts to improve the international situation and to limit armaments. This would be in keeping with the wishes of most of the members of the international community, as expressed in resolutions adopted by the UN General Assembly over the past few years. Those documents place special emphasis on the importance and timeliness of completing work to ban radiological weapons. The implementation of those UN decisions could contribute to success at the forthcoming Second Special Session of the UN General Assembly devoted to disarmament. The continuation by the Soviet Union and the United States of their joint efforts in that area will show the other members of the international community that the great powers heed their opinions and that they are aware of their responsibility for the destinies of the world.

It goes without saying that the completion of the work of many years to elaborate an arms control agreement could elicit at present a broad response that would create a more favorable political climate in the relations between the Soviet Union and the United States. This could mean a tangible, however modest, success for the champions of arms control and disarmament, irrespective of country, and a defeat of skeptics, pessimists, and those who would rather oppose the process of detente and arms control negotiations.

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Two respected international diplomats from the Soviet Union and the United States focus on the need for a treaty to ban the use of radiological weapons in the following articles. Radiological weapons are those based on the natural decay of nuclear material such as waste from military or civilian nuclear reactors. Such devices include both weapons or equipment, other than a nuclear explosive, designed to cause destruction or injury by dissemination of radioactive material.

Radiological weapons are generally considered one of many so called "weapons of mass destruction" which include nuclear explosives, chemical, and biological weapons. As yet undeveloped, radiological weapons have been the subject of investigation both in the Soviet Union and the United States and could conceivably be perfected for military use in the future. It was with this possibility in mind that the United States and the Soviet Union proposed in 1979 a joint draft of a Radiological Weapons Treaty to the Geneva based Committee on Disarmament (CD). Subsequently the joint draft has been under discussion in a working group of the CD.

In comparison to other compelling priorities for arms limitation and disarmament, a Radiological Weapons Treaty would be a modest achievement at best. However, under the current circumstances of heightened cold war rhetoric and mushrooming military budgets of the two superpowers even a modest agreement to ban a potentially highly destructive new weapons system assumes an added significance. It suggests the two major nuclear-weapon states have concluded that arms limitation progress must proceed and that more substantive agreements may be possible in the future.

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