

Is there a danger of radiological warfare?

A draft discussion paper circulated for comment

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We look forward to receiving your comments (unidir@unog.ch)

During the 2002 session of the Conference on Disarmament (CD) the delegation of Germany proposed that the CD consider the issue of radiological weapons. The proposal followed press reports about a radiological device or 'dirty bomb' allegedly constructed by terrorists with the intention to disperse radioactive material with conventional explosions. The subject is not new. In 1979, referring to the 1948 UN definition of weapons of mass destruction, which includes 'radioactive material weapons', the United States and the Soviet Union proposed the conclusion of a convention prohibiting radiological weapons. The declared aim was to prevent the misuse of radioactive material, which, as a result of the development of nuclear energy, was becoming available in large amounts to many countries. In the course of negotiations at the CD, divergent views emerged regarding the definition of the weapons in question as well as the scope of the proposed ban.

Definition

The United States and the Soviet Union defined a radiological weapon as any device 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, as well as any radioactive material (other than that produced by a nuclear explosive device) specifically designed for such use. Thus, a clear distinction was drawn between a weapon relying for its destructive effect on radiation emitted by radioactive material contained in it and a weapon relying for its destructive effect on heat and blast as well as radiation caused by the processes occurring at the time of a nuclear explosion. The former would be prohibited, the latter would not. Several nations objected to the definition of radiological weapons, which contained a clause excluding nuclear explosives; it could, in their opinion, 'legitimize' the use of nuclear weapons. An alternative formulation suggested at the CD to overcome the definitional hurdle was to consider as a radiological weapon any device containing radioactive material or waste as its principal harmful element and specifically designed or used to cause injury, death, environmental damage or destruction through the direct or indirect effects of ionizing radiation, without involving the critical assembly of any fissile material.

A radiological weapon should not be confused with the enhanced radiation/reduced blast weapon, commonly referred to as a 'neutron' weapon. The latter is a nuclear explosive device that kills mainly (but not exclusively) by radiation. The prohibition of the production, stockpiling,

deployment and use of neutron weapons was proposed in 1978 by the Soviet Union as a separate measure. The Soviet Union then contended that the introduction of neutron weapons would lower the nuclear threshold, increasing the possibility that an armed conflict would escalate to the level of an all-out nuclear war. However, the Soviet proposal, reiterated in 1981 when the United States decided to start the production of neutron weapons (intended to repel tank attacks in Europe by incapacitating the crews manning the tanks), was rejected by the Western powers. They argued that there was no reason to single out for special arms control treatment this particular nuclear weapon, which was less destructive than other nuclear weapons.

Scope of the intended prohibition

The convention (as envisaged in 1979) would have prohibited the development, production, stockpiling, possession, transfer and use of radiological weapons. However, so far, no nation is known to have manufactured a radiological weapon. In view of the enormous practical difficulties connected with the use of such a weapon in war, it is even doubtful whether any serious thought has been given to developing one. A very high radiation dose would be required to kill or injure people on the battlefield. One would need radioactive isotopes having a very short half-life, but these cannot be stored; they would decay before being used. Alternatively, one would need such large amounts of isotopes with long half-lives that the whole proposition would be impractical. Transport of significant quantities of radioactive material to the battlefield, or to areas destined to be denied to the enemy, would be a very cumbersome task, mainly because of the heavy protective shielding which would be needed. It is also hard to conceive of the delivery of this material to intercontinental targets for strategic purposes.

On the other hand, it is technically possible to use radioactive material of lower activity so as to cause long-term effects harmful to life or health after months or years, or even to future generations. For this purpose one might use materials having a relatively long half-life, for instance strontium-90, which has a half-life of about twenty-eight years. These materials can be obtained from the radioactive waste of reactors. However, there would be little military rationale for producing long-term harmful effects with radioactive materials.

Protection of radioactive material in international transport

Efforts to restrict the availability of radioactive material for non-peaceful purposes have been made during the past three decades. A major step in this direction was the 1980 Convention on the Physical Protection of Nuclear Material. This convention, in force since 1987, obliges the parties to ensure that during international transport across their territory or on ships or aircraft under their jurisdiction nuclear material, as categorized in an annex, is protected at the agreed level. It does not, however, apply to the physical protection of nuclear material for military purposes or to the protection of other radioactive sources.

Furthermore, the parties to the Physical Protection Convention undertook not to export or import nuclear material or allow its transit through their territory, unless they had received assurances that this material would be protected during international transport in accordance with the levels of protection determined by the convention. The parties also agreed to share information on missing nuclear material to facilitate recovery operations. Robbery, embezzlement or extortion in relation to nuclear material, and acts without lawful authority involving nuclear material which cause or are likely to cause death or serious injury to any person or substantial damage to property, are to be treated as punishable offences. Each party must inform the depositary of its laws and regulations giving effect to the convention. In 1997 the International Maritime Organization (IMO)

decided to incorporate the Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships (INF Code) into the International Convention for the Safety of Life at Sea.

In 1998 a group of experts convened by the IAEA Director General to review all Agency programmes urged that consideration be given to the possible revision of the Convention on the Physical Protection of Nuclear Material. Subsequently, the IAEA experts recommended that the scope of the convention be expanded by requiring member states to pass legislation implementing IAEA Guidelines on a range of issues, including how nuclear materials and facilities can be protected from sabotage. A formal conference is needed to amend the convention.

Protection of radioactive material in domestic activities

Within states, the responsibility for physical protection of radioactive material rests with the governments. However, such protection is a matter of worldwide concern. Since the effectiveness of physical protection in one state may depend on measures taken by another state, there is a need for international cooperation. Theft of plutonium or highly enriched uranium could lead to the construction of an explosive device capable of causing mass destruction. Moreover, an act of sabotage against a nuclear facility or against a shipment of nuclear material within one country could create a radiological hazard to the populations of other countries. To deal with these problems, the IAEA published recommendations for what member states can do to establish national systems for the protection of nuclear facilities and of nuclear material in use, transport and storage, or to improve the quality and the effectiveness of the existing systems. The IAEA International Physical Protection Advisory Service (IPPAS) provides advice and assistance to member states in translating these recommendations into specific requirements.

The 1997 Guidelines for the Management of Plutonium set out the policies that a number of states, including the nuclear-weapon states, decided to follow with regard to plutonium. In accordance with these guidelines, annual statements of national holdings of civil unirradiated plutonium and of plutonium contained in spent civil reactor fuel are submitted to the IAEA.

Under the 1994 Convention on Nuclear Safety, in force since October 1996, the parties agreed: to achieve a high level of nuclear safety world-wide through the enhancement of national measures and international cooperation, including safety-related technical cooperation; to establish effective defences in nuclear installations against potential radiological hazards in order to protect individuals, society and the environment from harmful effects of ionizing radiation from such installations; to prevent accidents with radiological consequences and to mitigate such consequences should they occur. The parties must submit reports at periodic review meetings on measures taken to implement their obligations. The convention covers only civilian nuclear power plants.

Banning attacks on nuclear facilities

A proposal was also put forward to prohibit deliberate damage to nuclear reactors or other nuclear facilities, which could cause release of radioactive material and contamination of the environment. The Chernobyl reactor accident in 1986 demonstrated the disastrous consequences of such a release. In fact, attacking nuclear facilities would seem to be, at least at present, the only conceivable way of waging radiological warfare.

According to the 1977 Protocol I to the 1949 Geneva Conventions, relating to the protection of victims of international armed conflicts, 'nuclear electrical generating stations' are not to be

made the object of attack if such attack may cause the release of dangerous forces and consequent severe losses among the civilian population. However, the protection may cease if the station provides electric power 'in regular, significant and direct support of military operations and if such attack is the only feasible way to terminate such support'. This reservation is vague enough to bring to naught the ban to which it is attached. Moreover, the Protocol prohibition does not cover facilities committed to military use, while in the field of civilian use it leaves out installations with large quantities of radioactive materials. The latter include research reactors, cooling ponds which contain fuel elements removed from the reactor before they are shipped to reprocessing plants, reprocessing plants where the spent fuel elements are chemically treated to separate uranium and plutonium from the waste products, and storage tanks containing high-level radioactive wastes. A more adequate and much stricter legal norm would be needed than the existing rule of international humanitarian law.

So far, only India and Pakistan—countries with a comparable level of nuclear development—have succeeded in reaching, in 1988, an agreement banning the destruction of or damage to nuclear installations or facilities. (In the spring of 1998, during the period of heightened tension between the two countries, Pakistan accused India of preparing to attack the Pakistani nuclear facilities, but India dismissed the allegation.) The agreement has remained in force in spite of the armed clashes along the border between the two countries, and the parties have exchanged information concerning the emplacement of their nuclear installations and facilities. However, the CD, which had been trying for years to work out a global ban on attacks against such objectives, encountered many obstacles. Indeed, establishing a relevant international rule, with a degree of certainty that it will be universally observed under all circumstances, is extremely complex. Wanton destruction of nuclear power stations and of other peaceful nuclear facilities could be inhibited by a ban. However, a country suspecting that its actual or potential non-nuclear-weapon enemy is engaged in clandestine production of nuclear-weapon material might not hesitate, in a situation of acute international crisis or war, to attack the relevant, ostensibly civilian, installations, invoking the imperative of ultimate defence. This is what happened in 1981, when Israeli aircraft attacked the Iraqi nuclear centre, and in 1991, when US aircraft attacked Iraqi nuclear facilities during the Gulf War. There was no dangerous release of contaminants, but there could have been if the reactors had been loaded with large quantities of nuclear fuel and if they had been in operation at the time of the bombing.

Action against nuclear terrorism

In March 2002 the IAEA Board of Governors agreed on an 'action plan' designed to upgrade worldwide protection against acts of nuclear terrorism. The plan covers the following areas: physical protection of nuclear material and nuclear facilities; detection of malicious activities (such as illicit trafficking) involving nuclear and other radioactive materials; strengthening of state systems for nuclear material accountancy and control; security of radioactive sources; assessment of safety- and security-related vulnerabilities at nuclear facilities; response to malicious acts or threats thereof; adherence to international agreements and guidelines; and enhancement of programme coordination and information management for nuclear safety-related matters. A number of states pledged specific sums of money for a special fund set up to support the plan. Several others announced in-kind support.

As regards the danger that terrorists might manufacture a radiological bomb, the opinions differ. The fact is that in order to build such a bomb one would need such a concentration of radioactive material that the device would kill the builders. Moreover, the accumulated radioactivity would generate such high temperatures that the device would melt before being used. The spreading of unconfirmed information about a new apocalyptic weapon, supposedly easy to produce by individuals, may help the terrorists to create an atmosphere of generalized panic.

Conclusion

The question of prohibiting radiological weapons was considered in the CD along with proposals for the prohibition of new types of weapons and new systems of weapons of mass destruction. Certain countries favoured a general ban on such weapons, possibly through a single treaty. However, an agreement encompassing all imaginable weapons based on new scientific or technological principles could not be sufficiently clear as regards its object or sufficiently precise as regards its scope to produce real arms control effects. In addition, verification of an omnibus treaty would encounter enormous difficulties, as it would involve monitoring a wide gamut of activities, the military implications of which are often not obvious.

It would seem more practical to tackle each specific and clearly identified new weapon of mass destruction separately, taking account of its peculiarities. On the other hand, it is generally considered easier to ban arms at the research and experimentation stage than to eliminate those already developed, manufactured and stockpiled. In order to detect signs of the development of a new weapon with the potential to cause mass destruction, pertinent scientific discoveries and inventions would need to be internationally and impartially reviewed by scientific experts, and their possible military impact examined. This approach could apply to radiological weapons. Before starting a debate on the prohibition of such weapons, the feasibility of using radioactivity for hostile purposes, whether by states or individuals, should be reliably assessed.