



The Experience of Nuclear Weapon-Free Zones

Marc Finaud¹

May 2014

This article was originally a background paper for the SWP-BASIC² workshop on: “Non-Strategic Nuclear Weapons in Europe: Transparency and Confidence-Building Measures in Practice”, Berlin 27-28 March 2014.

1. Background

Since the Pelindaba Treaty on the African Nuclear Weapon-free Zone (NWFZ) entered into force (on 15 July 2009), there are six such zones in the world:

- a) The **Antarctic**: 1959 Antarctic Treaty
- b) **Latin America and the Caribbean**: 1976 Tlatelolco Treaty
- c) The **South Pacific**: 1985 Rarotonga Treaty
- d) **Southeast Asia**: 1995 Bangkok Treaty
- e) **Africa**: 1996 Pelindaba Treaty
- f) **Central Asia**: 2006 Semipalatinsk Treaty

One can add the single-state zone of **Mongolia** declared in 1998, although this is generally viewed as redundant with that country’s membership in the Non-Proliferation Treaty (NPT). In addition, let’s recall that the international agreements regarding **Austria**, **Germany** and **Japan** after World War II excluded the possession of nuclear weapons by those states, and that the Two-Plus-Four Agreement on German reunification also provided for united **Germany**’s “renunciation of the manufacture and possession of and control over nuclear weapons.”

These land zones now cover:

- 56% of the surface of the Earth
- 60% of the 193 Member States of the UN
- But only 39% of the world population (because of the large populations of China and India).

The NWFZs also apply to the territories of the nuclear-weapon states located within the zones through those states’ adherence to specific Protocols. In addition, nuclear-weapon states also commit not to deploy their nuclear weapons in the zone or to use them against members of the zones.

¹ Senior Advisor, Emerging Security Challenges Programme, Geneva Centre for Security Policy (GCSP), and Senior Resident Fellow, United Nations Institute for Disarmament Research (UNIDIR).

² This paper is part of a joint BASIC-SWP project on tactical nuclear weapons in Europe. The project is financially supported by the William and Flora Hewlett Foundation. Any opinions expressed in this article do not necessarily reflect those of the associated organizations or funders. The author is solely responsible for the content of this paper.

NWFZs include land territories, national air space, and territorial waters but not **international waters** (characterized by freedom of navigation). The 1971 Seabed Treaty prohibits the placement “on the seabed and the ocean floor and in the subsoil thereof... of any nuclear weapons... as well as structures, launching installations or any other facilities specifically designed for storing, testing or using such weapons.” States Parties of the 1967 Outer Space Treaty agreed “not to place in orbit around the Earth any objects carrying nuclear weapons...; install such weapons on celestial bodies, or station such weapons in outer space in any other manner.” Nuclear weapons can transit through space on a trajectory (on ballistic missiles). In the 1979 Moon Treaty, States Parties agreed not to “place in orbit around or other trajectory to or around the Moon objects carrying nuclear weapons... or use such weapons on or in the Moon; [and] ... [test there] any type of weapons.”

2. The Relevance of Nuclear-Weapon-Free Zones to Europe

There were a number of proposals during the Cold War to turn Europe or parts of Europe into one or several nuclear-weapon free zone(s).³ In 1956 the Soviet Union introduced a plan to prohibit nuclear weapons within both the **German** states and some adjacent countries. In 1957, Poland proposed the **Rapacki Plan** to outlaw both the manufacture and harbouring of nuclear arsenals in all territories of Poland, Czechoslovakia, the German Democratic Republic and the Federal Republic of Germany. Enforcement was to be supervised by a commission with NATO countries, Warsaw Pact members and non-aligned states. The plan was rejected by NATO because, among other reasons, it did not include the deployment of conventional armaments in which the Warsaw Pact had superiority. In 1958, a revised Rapacki Plan suggested freezing nuclear stockpiles within the zone and, later, to accompany the removal of these weapons by controlled and mutually-agreed conventional reductions. In 1962, the Polish plan also offered other European countries to join the initial zone if they so wished. In 1964, the **Gomulka Plan** offered more restricted goals. Despite NATO’s rejection of all these efforts, they were met with sympathy in Scandinavia. In 1961, Sweden tabled the **Unden Plan** which promoted nuclear-free zones. In 1963, Finnish President Kekkonen called on Finland, Sweden, Denmark and Norway to confirm their nuclear weapon-free status collectively. In 1957, Romanian Prime Minister K. Stoyka, proposed to make the **Balkans** a region without foreign military bases, and therefore free of nuclear weapons. This plan was reiterated in 1968 and in 1972. Soviet leader Nikita Khrushchev in 1959 suggested a **Nordic** nuclear-free zone and in 1963 launched a similar proposal for a nuclear-free **Mediterranean**. In 1981, Bulgaria proposed a meeting of the leaders of the Balkan states to discuss a nuclear-free zone. At the same time, Swedish Prime Minister Olof Palme made his proposal of a tactical nuclear weapon-free zone in **Central Europe**.

“Despite the diversity of geopolitical situations, most countries who made such a choice realized that their security would be best guaranteed as non-nuclear weapon states.”

Soon after the end of the Cold War, all former Soviet nuclear weapons that had been stationed outside the Russian Federation were repatriated to Russian soil, while the United States retained a number of non-strategic weapons on the territory of some NATO members. As a reaction to some former Warsaw Pact countries’ accession to NATO, in 1996 Belarus proposed a nuclear weapon-free zone in **Central and Eastern Europe**.

The 1987 US-Soviet **Intermediate Nuclear Forces** Treaty (INF) successfully eliminated nuclear-capable missiles with ranges of between 500 and 5,500 km from Europe, and a total of 2,692 of such weapons were destroyed. The US-Russia 1991 **START Treaty I** also contained clauses that prevented each Party “to base strategic offensive arms subject to the limitations of this Treaty outside its national territory” (i.e. including in Europe); if nuclear-capable heavy bombers had to be deployed outside the national territory, the Parties

³ See: S. Pande, “Scope for Nuclear-Weapon Free Zone in Central and Eastern Europe”, Federation of American Scientists (<http://www.idsa-india.org/an-oct8-1.html>).

would consult with each other. The May 1992 **Lisbon Protocol** ensured that the strategic nuclear weapons formerly deployed in Belarus, Kazakhstan and Ukraine were transferred to Russia. Finally, under unilateral US and Russian presidential declarations (“**Presidential Nuclear Initiatives**” or PNIs⁴) in 1991 both sides pledged to withdraw all land-based sub-strategic nuclear weapons from their theatres of deployment, all non-strategic nuclear weapons from naval vessels, and either to dismantle them or keep them in centrally located storage facilities. The combined effect of the INF, START I and the PNIs is that the zonal area proposed by Belarus⁵ has no nuclear weapons deployed within its boundaries.

3. The Main Provisions of the NWFZs

Although each NWFZ agreement is specific and the result of particular geopolitical and strategic contexts, the treaties prohibiting the acquisition or deployment of nuclear weapons generally address similar questions.

- a) **Scope:** most zonal agreements, by definition, prohibit the development, manufacture, deployment, testing, possession, transfer, control over and use of nuclear weapons. However, some treaties go beyond nuclear weapons and include all ‘weapons of mass destruction’, i.e. also chemical and biological (Outer Space Treaty, Seabed Treaty, Moon Treaty) or even all types of weapons, including conventional ones (Antarctic, Outer Space and Moon Treaties for testing). In addition to activities related to nuclear weapons, some treaties also prohibit other military activities, such as: the establishment of military bases, installations and fortifications, the carrying out of military manoeuvres (in the Antarctic, Outer Space and the Moon Treaties); any use of force (on or from the Moon in the Moon Treaty); attacks on nuclear installations (in the Pelindaba Treaty). Finally, some agreements also address an environmental issue, the dumping/disposal of radioactive waste material (Antarctic, Rarotonga, Bangkok and Pelindaba Treaties).
- b) **Issue of transfer:** as said above, the zonal treaties do not apply to international waters but vessels or aircraft carrying nuclear weapons or nuclear materials or radioactive waste may be accepted by some zone member states in their territorial waters or air space “in a manner not covered by the rights of innocent passage” i.e. by requesting notification and granting authorization. This exception to the rule of innocent passage is justified, considering the dangerous nature of the materials involved, by article 82 of the UN Convention on the Law of the Sea and Article 6(1) of the 1989 Basel Convention. This provision is contained in the Rarotonga and Pelindaba Treaties. The relevant provision of the Semipalatinsk Treaty is even more permissive: “Without prejudice to the purposes and objectives of this Treaty, each Party, in the exercise of its sovereign rights, is free to resolve issues related to transit...”
- c) **Verification and Compliance:** most zonal treaties establish an institution or “control system” mandated to monitor the implementation of the treaty provisions and/or examine complaints of states parties: the Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (OPANAL) in the Tlatelolco Treaty, a Consultative Committee in the Rarotonga Treaty, the Commission for the Southeast Asia Nuclear Weapon-Free Zone in the Bangkok Treaty, the African Commission on Nuclear Energy in the Pelindaba Treaty. As an exception, the Semipalatinsk Treaty does not provide for such a permanent organisation but only for annual or extraordinary meetings of states parties and negotiations in case of disputes. All NWFZs also rely on IAEA safeguards to verify that nuclear energy is used for peaceful purposes by states parties. The latest treaty, covering Central Asia, also requires ratification of the IAEA Additional Protocol as a condition of membership in the zone.
- d) **The obligations of Nuclear-Weapon States:** NWFZs are only viable if the zonal states abide by their non-proliferation commitments and the Nuclear-Weapon States undertake not to transfer, station,

⁴ Arms Control Association, “The Presidential Nuclear Initiatives at a Glance” (<https://www.armscontrol.org/factsheets/pnigance>)

⁵ According to the Belarus proposal, a core group of countries with primary responsibilities would consist in: the Baltic States, Belarus, Bulgaria, the Czech Republic, Hungary, Moldova, Poland, Romania, Slovakia, and Ukraine. A second group, shouldering those obligations of the first group which meet their respective interest, could include Albania, Austria, Finland, Sweden and the states of the former Yugoslavia. The third group of states could include Norway, Denmark and Germany (see: S. Pande, op. cit.).

test, deploy or use their nuclear weapons in the zones. This is why all NWFZs have protocols open to signature by the Nuclear-Weapon States. It is worth noting that when mentioned by name (in all the protocols except those to the Tlatelolco Treaty), only the five NPT-recognized nuclear-weapon states are invited to sign and ratify those instruments; the support of the non-NPT nuclear-armed states was never actively sought nor offered (although India unilaterally declared its willingness to respect the African NWFZ). All relevant protocols have been signed and ratified by the five with a few exceptions:

- i. Rarotonga Treaty: the United States has signed but not ratified the three Protocols, which are applicable to American Samoa and Jarvis Island.
- ii. Pelindaba Treaty: the United States has declared that neither the Treaty nor its protocols I and II apply to activities by non-member state parties on Diego Garcia. On this Indian Ocean atoll claimed both by the UK and Mauritius, US armed forces conduct logistic support to operational forces, including nuclear, deployed to the Indian Ocean and Persian Gulf areas. Spain has not signed Protocol III open to states with possessions in Africa.
- iii. Bangkok Treaty: none of the nuclear-weapon states has signed the protocols, largely due to US and French objections regarding the unequivocal nature of security assurances and over the definition of territory which includes exclusive economic zones (EEZ) considered as international waters by those states.
- iv. Semipalatinsk Treaty: The United States, UK and France considered that the Collective Security Treaty would allow Russia to deploy nuclear weapons in Central Asia because of its respect for previous arrangements, and therefore were not ready to sign the Protocol to the Semipalatinsk Treaty, supported by Russia and China. But consultations took place between the nuclear-weapon states and the zonal states to enable signature of the protocols by the United States, the UK and France.

4. Lessons Learned in NWFZs

What lessons can be learned from the functioning and implementation of these legally-binding NWFZs for any further political arrangements for confidence-building and constraints on military activities in Europe, especially to non-strategic nuclear weapons? The main purpose of both approaches is similar: to establish or strengthen trust and confidence in the non-aggressive intentions and capabilities of the other side. This was the philosophy behind the CSCE, the OSCE and the CFE Treaty regarding military activities and manpower as well as conventional armaments: to prevent large-scale offensive surprise attack. It is not accidental that the United Nations Register of Conventional Arms and more recently the Arms Trade Treaty identified the same categories of destabilizing heavy conventional weapons as in the CFE Treaty,⁶ with the addition of small arms and light weapons.

Non-strategic nuclear weapons in Europe are perceived by those states that are protected by them as a reassuring asset. NATO nations consider them as a security guarantee from the United States. Russia considers its own weapons as a way of preventing escalation to the use of strategic weapons, and as a balance to the British and French deterrents.

NWFZ agreements have generally been completed between states that do not and never have had nuclear weapon programmes, with the following exceptions:

- The only case when actual nuclear weapons have been manufactured and deployed while a NWFZ was being negotiated was the case of **South Africa**, which had a monopoly and renounced it before joining the treaty and the NPT. This was a purely national choice taking into account new threat perceptions resulting from the end of the Cold War but mainly domestic considerations.

⁶ Battle tanks, armoured combat vehicles, large-calibre artillery systems, combat aircraft, attack helicopters, warships, missiles and missile launchers.

- In the case of **Latin America**, in the 1990s Brazil and Argentina did agree on renouncing the nuclear weapon programmes that they had began to develop in the 1970s and 1980s, mostly because of their democratization, economic constraints and the realization that their mutual interests would be better served by cooperation in peaceful uses of nuclear energy. Having set up a bilateral system of verification of their non-proliferation pledge, they could join the Tlatelolco Treaty and the NPT.
- In the **South Pacific**, the only nuclear weapons ever deployed in the region were under the control of France when testing them, and the determination of the regional countries to put an end to this testing was the main motive in negotiating the Rarotonga Treaty.
- In the case of **Central Asia**, the main controversial aspect of the Semipalatinsk Treaty is the clause regarding the validity of previous treaties such as the Tashkent Treaty whereby Russia would be allowed to apply its nuclear deterrence to protect Central Asian countries.

But in all those cases, NWFZ treaties were made possible by the strategic choice of the regional states to renounce nuclear weapons for themselves and ensure that nuclear-weapon states would respect that choice. Despite the diversity of geopolitical situations, most countries who made such a choice realized that their security would be best guaranteed as non-nuclear weapon states. Despite a history of conventional conflicts in some regions, their level of mutual trust was, in most cases, higher than in Europe during the Cold War and to some extent after the Cold War, especially now after the annexation of a part of Ukraine by Russia.

The implementation of NWFZ treaties is generally smooth and based on mutual cooperation. In order to strengthen the confidence in compliance with non-proliferation commitments, however, verification regimes combine regional mechanisms and the reliance on IAEA safeguards. Regular consultations allow for any doubt or interrogation about compliance to be discussed in a non-confrontational atmosphere. Regular information exchanges also promote transparency, which is crucial for maintaining confidence and trust. One recent potential difficulty appeared in the framework of the Rarotonga Treaty, which prohibits the export of nuclear materials such as uranium (by Australia) to states that do not apply full-scope safeguards (India). This problem may occur again in other regions because most treaties only consider the NPT definitions of nuclear- and non-nuclear weapon-states (thus not recognising as legitimate the possession of nuclear weapons by non-member states).

5. Conclusions

Comparisons are always difficult, especially when there are such differences in the historical and strategic contexts as between Europe and other regions. However, in order to restore and strengthen confidence and trust in Europe especially between NATO countries and Russia regarding non-strategic nuclear weapons, some considerations could be kept in mind:

- a) Politically (non-legally) binding commitments such as the CSCE and OSCE Documents have their value and may be easier to adopt, but, ultimately, legally binding agreements including verification systems and on-site inspections have proved to be more likely to be effective in generating mutual trust in compliance.
- b) When selecting categories of armaments to submit to constraints or to eliminate, priority should be given to those categories that are the most destabilizing or likely to be used for offensive operations.
- c) Agreements in Europe require the United States and Russia to consider their responsibilities and strategic interests beyond Europe, including Russia's threat perceptions coming from China. China shares Russia's focus on "strategic stability", a code phrase for the preservation of a nuclear deterrent based on second-strike capability.

- d) Because of those global considerations, although it can be useful to de-couple elements of a negotiation for practical purposes, it would not be productive to address:
- i. Non-strategic nuclear weapons separately from strategic nuclear weapons;
 - ii. Offensive nuclear weapons separately from strategic defensive systems, in particular anti-ballistic missile defence including space-based assets;
 - iii. Land-based or air-based non-strategic nuclear weapons deployed in Europe (including by Russia on its national territory) separately from sea-launched missiles that may substitute them and are not confined to a geographically delineated area;
 - iv. Nuclear weapons separately from conventional weapons, for three main reasons: both NATO and Russia maintain a doctrine of possible nuclear response to deter a conventional attack; Russia maintains non-strategic nuclear weapons to compensate for NATO's conventional superiority; and Russia is concerned about the development of a US Global Prompt Strike that may include conventional missile capabilities with strategic impact and contributing to possible first strike capabilities, difficult to distinguish from nuclear attacks.
- e) In order to facilitate the gradual elimination of non-strategic nuclear weapons from Europe, apart from addressing the above-mentioned linkages, geographical considerations will need to be factored in, especially the removal of Russian weapons away from its European territory to a distance that would be equivalent to the removal of US weapons, taking into account the time needed to reintroduce them if needed. Eventually, the best way of reassuring the other side would be the total elimination of those weapons under mutually agreed verification, as was done under the INF Treaty.

Annex: The Main Provisions of the Treaties Prohibiting Nuclear Weapons in Some Zones or Environments

Treaty	Nuclear Weapons	Other WMD	Other Military Activity	Dumping of Nuclear Waste	Protocol for Nuclear-Weapon States
1959 Antarctic Treaty	... the testing of any type of weapon; ... any nuclear explosions	... the testing of any type of weapon	any measure of a military nature, eg. military bases and fortifications, military manoeuvres and the testing of any type of weapon	the disposal of radioactive waste material	
1967 Outer Space Treaty	... not to place in orbit around the Earth any objects carrying nuclear weapons...; install such weapons on celestial bodies, or station such weapons in outer space in any other manner; the testing of any type of weapons	... not to place in orbit around the Earth any objects carrying... any kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner: the testing of any type of weapons	... the establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies		
1967 Tlatelolco Treaty	a) The testing, use, manufacture, production or acquisition by any means whatsoever of any nuclear weapons, by the Parties themselves, directly or indirectly, on behalf of anyone else or in any other way, and b) The receipt, storage, installation, deployment and any form of possession of any nuclear weapons, directly or indirectly, by the Parties themselves, by anyone on their behalf or in any other way. 2. ... refrain from engaging in, encouraging or authorizing, directly or indirectly, or in any way participating in the testing, use, manufacture, production, possession or control of any nuclear weapon				undertake... not to contribute in any way to the performance of acts involving a violation of the... Treaty; and... not to use or threaten to use nuclear weapons against the Contracting Parties
1971 Seabed Treaty	... not to emplant or emplace on the seabed and the ocean floor and in the subsoil thereof... any nuclear weapons... as well as structures, launching installations or any other facilities specifically designed for storing, testing or using such weapons. ... not to assist, encourage or induce any State to carry out [such] activities... and	... not to emplant or emplace on the seabed and the ocean floor and in the subsoil thereof... any other types of weapons of mass destruction... as well as structures, launching installations or any other facilities specifically designed for storing, testing or using such weapons. ... not to assist,			

	not to participate in any other way in such actions.	encourage or induce any State to carry out [such] activities... and not to participate in any other way in such actions.			
1979 Moon Treaty	States Parties shall not place in orbit around or other trajectory to or around the Moon objects carrying nuclear weapons... or use such weapons on or in the Moon; ...the testing of any type of weapons	States Parties shall not place in orbit around or other trajectory to or around the Moon objects carrying... any... kinds of weapons of mass destruction or place or use such weapons on or in the Moon;... the testing of any type of weapons	Any threat or use of force or any other hostile act or threat of hostile act on the Moon... .. prohibited to use the Moon in order to commit any such act or to engage in any such threat in relation to the Earth, the Moon, spacecraft, the personnel of spacecraft or man- made space objects. ...The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on the Moon...		
1985 Rarotonga Treaty	not to manufacture or otherwise acquire, possess or have control over any nuclear explosive device; not to seek or receive any assistance in the manufacture or acquisition of any nuclear explosive device; not to take any action to assist or encourage the manufacture or acquisition of any nuclear explosive device by any State. ... prevent in its territory the stationing of any nuclear explosive device. Each Party in the exercise of its sovereign rights remains free to decide for itself whether to allow visits by foreign ships and aircraft to its ports and airfields, transit of its airspace by foreign aircraft, and navigation by foreign ships in its territorial sea or archipelagic waters in a manner not covered by the rights of innocent passage, archipelagic sea lane passage or transit passage of straits.			not to dump radioactive matter at sea; to prevent the dumping of radioactive matter by anyone in its territorial sea; to support the conclusion as soon as possible of the proposed Convention relating to the protection of the natural resources and environment of the South Pacific region and its Protocol for the prevention of pollution of the South Pacific region by dumping.	
1995 Bangkok Treaty	(a) develop, manufacture or otherwise acquire, possess or have control over nuclear weapons;			(a) dump at sea or discharge into the atmosphere anywhere within the	... to respect the Treaty..., and not to contribute to

	(b) station or transport nuclear weapons by any means; or (c) test or use nuclear weapons. ... not to allow, in its territory, any other State to: a) develop, manufacture or otherwise acquire, possess or have control over nuclear weapons; (b) station nuclear weapons; or (c) test or use nuclear weapons. ... not to: (a) seek or receive any assistance in the commission of any act in violation of the [above] provisions...; or (b) take any action to assist or encourage the commission of any act in violation of the [above] provisions...			Zone any radioactive material or wastes (b) dispose radioactive material or wastes on land in the territory of or under the jurisdiction of other States...; or (c) allow, within its territory, any other State to dump at sea or discharge into the atmosphere any radioactive material or wastes	any act which constitutes a violation of the Treaty or its Protocol... ...not to use or threaten to use nuclear weapons against any State Party to the Treaty. ...not to use or threaten to use nuclear weapons within the... Zone
1996 Pelindaba Treaty	... the stationing of any nuclear explosive device. ... decide for itself whether to allow visits by foreign ships and aircraft to its ports and airfields, transit of its airspace by foreign aircraft, and navigation by foreign ships in its territorial seas or archipelagic waters in a manner not covered by the rights of innocent passage, archipelagic sea lane passage or transit passage of straits.		... not to take, or assist, or encourage any action aimed at an armed attack by conventional or other means against nuclear installations in the... Zone.	Not to take any action to assist or encourage the dumping of radioactive wastes and other radioactive matter anywhere within the Zone.	... not to use or threaten to use a nuclear explosive device against any Party to the Treaty or any territory within the Zone .
2006 Semipalatinsk Treaty	(a) Not to conduct research on, develop, manufacture, stockpile or otherwise acquire, possess or have control over any nuclear weapon or other nuclear explosive device by any means anywhere; b) Not to seek or receive any assistance in research on, development, manufacture, stockpiling, acquisition, possession or obtaining control over any nuclear weapon or other nuclear explosive device; (c) Not to take any action to assist or encourage the conduct of research on, development, manufacture, stockpiling, acquisition or possession of any nuclear weapon or other nuclear explosive device; (d) Not to allow in its territory: (i) The production, acquisition, stationing, storage or use, of any nuclear weapon or			... not to allow the disposal in its territory of radioactive waste of other States.	... not to use or threaten to use a nuclear weapon or other nuclear explosive device against any Party to the Treaty. ... not to contribute to any act that constitutes a violation of the Treaty or of this Protocol by Parties to them.

	<p>other nuclear explosive device; (ii) The receipt, storage, stockpiling, installation or other form of possession of or control over any nuclear weapon or other nuclear explosive device; (iii) Any actions, by anyone, to assist or encourage the development, production, stockpiling, acquisition, possession of or control over any nuclear weapon or other nuclear explosive device. Without prejudice to the purposes and objectives of this Treaty, each Party, in the exercise of its sovereign rights, is free to resolve issues related to transit through its territory by air, land or water, including visits by foreign ships to its ports and landing of foreign aircraft at its airfields. (a) Not to carry out any nuclear weapon test explosion or any other nuclear explosion; (b) To prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control; (c) To refrain from causing, encouraging, or in any way participating in the carrying out of any nuclear weapon test explosion or any other nuclear explosion.</p>				
--	--	--	--	--	--

