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NUCLEAR TERRORISM

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NUCLEAR TERRORISM

INTRODUCTION

Terrorist attacks of all types have increasingly become a concern worldwide, forcing parliamentarians of several countries – including Canada – to examine new measures for countering potential terrorist threats in order to protect their respective populations. Despite a wealth of information available on the subject of terrorism, none is specifically targeted to Canadian lawmakers. Thus, the Library of Parliament has produced three background papers on terrorism, each dealing with a different type of terrorist threat: biological, chemical and nuclear. This paper provides background information on the nuclear threats posed by subnational terrorist groups. Nuclear terrorism is defined as the use of radioactive material or nuclear explosives, and attacks on nuclear facilities, by non-state-sponsored individuals or groups to create fear or terror with a credible threat.(1)

POTENTIAL THREATS

The effects of a nuclear explosive device are numerous; they include the production of heat, of a blast and an electro-magnetic pulse, and the release of radiation. The nuclear weapons most likely to be used by terrorists would be low-yield devices, incapable of levelling whole cities. These bombs would probably be on the order of 1 kiloton, which is equivalent to 1,000 tons of TNT. However, even a crude device that fizzled could wreak tremendous havoc, contaminating a significant area with radioactivity and spreading terror and fear. This is only one of the potential threatening scenarios involving nuclear terrorism. The various potential nuclear threats that terrorists could pose fall into three groups:

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(1) Bernard Anet, *Nuclear terrorism: the ultimate form of terrorism?* Spiez Laboratory, Department of Physics and Nuclear Issues, Swiss Federal Department of Defence, Civil Protection and Sports, Spiez, Switzerland, 2001, http://www.vbs.admin.ch/acls/e/current/fact_sheet/nuklearterrorismus/dubrovnik/.

- radiological dispersion bomb (dirty bomb);
- attacks on nuclear facilities; and
- nuclear bombs.

A. Radiological Dispersion Bomb (Dirty Bomb)

The most accessible nuclear device for any terrorist group would be a radiological dispersion bomb, or so-called "dirty bomb." This would consist of waste derived from nuclear activities, such as nuclear reactor by-products, wrapped together with conventional explosives; upon detonation, this combination would disperse radioactive substances, contaminating air, water and land, rendering a particular area or facility unusable for many years. Radioactive materials that could be used for such a weapon are available from a wide range of relatively non-secure facilities, including hospitals, medical and research laboratories, universities, and radioactive waste dumps.(2) Radioactive waste from all stages of the nuclear fuel cycle is widely found throughout the world and, in general, is not as well guarded or protected as actual nuclear weapons or nuclear power plants.(3)

In Canada, radioactive waste can be found in many locations including the five commercial nuclear power sites in Ontario, Quebec and New Brunswick. Radioactive waste falls into three categories: nuclear fuel waste (high-level waste); low-level waste; and uranium mine and tailings.(4) High-level radioactive waste (nuclear fuel waste) is the subject of Bill C-27, an Act respecting the long-term management of nuclear fuel waste, currently before Parliament.(5) This type of waste comes from power reactors, prototype and demonstration power reactors, and research and isotope production reactors such as those found at some universities and commercial facilities (e.g., MDS-Nordion in Chalk River, Ontario). High-level

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(2) Solicitor General Canada, *Developing options to strengthen national consequence management response capability for terrorist incidents*, Ottawa, 2001, http://www.dnd.ca/dcds/dnbcd/dnbcd_home/Documents/Strengthen%20National%20CT%20Response.pdf.

(3) Bruce Blair, *What if the terrorists go nuclear?* Center for Defense Information, Washington, D.C., 2001, http://www.cdi.org/terrorism/nuclear.cfm.

(4) Jean-Luc Bourdages, *Bill C-27: An act respecting the long-term management of nuclear fuel waste*, LS-405E, Parliamentary Research Branch, Library of Parliament, Ottawa, 2001, http://www.parl.gc.ca/common/Bills_House_Government.asp?Language=E&Parl=37&Ses=1#C-27.

(5) The bill had Second Reading on 2 October 2001, was referred to the Standing Committee on Aboriginal Affairs, Northern Development and Natural Resources, and their report was tabled on 22 November 2001.

waste represents only 3% of the volume of all radioactive waste worldwide, but 95% of the radioactivity, while low-level waste amounts to 90% of the volume and 1% of the total radioactivity.(6) High-level waste is characterized by a complex mixture of: short-lived, very radioactive isotopes; and long-lived heavy elements. Low-level waste, as defined by the Low-Level Radioactive Waste Management Office of Atomic Energy Canada Limited (AECL),(7) includes non-fuel radioactive waste currently being produced as a by-product of operations at Canada's nuclear reactors, nuclear fuel processing and fabrication facilities, as well as from the medical, research and industrial uses of radioisotopes.

Both high- and low-level radioactive waste also exists overseas; every year, tons of waste are transported over long distances, including between continents, particularly for reprocessing. The United States, Japan and various European countries are important generators and exporters of nuclear waste. In Russia, security for nuclear waste is especially poor, and the potential for diversion by subnational radical groups has been shown to be very real indeed. In 1996, Islamic rebels from the breakaway province of Chechnya planted, but did not detonate, a "dirty bomb" in Moscow's Izmailovo Park to demonstrate Russia's vulnerability. This device consisted of dynamite and Cesium-137, one of the highly radioactive by-products of nuclear fission.(8)

If exploded in a major urban area, extreme versions of gamma-ray emitting bombs (e.g., nuclear spent fuel and dynamite) could cause more than 2,000 immediate deaths and many thousands more would suffer from radiation poisoning.(9) However, such a use of radioactive contamination to cause mass casualties is more difficult to achieve than commonly believed. It would, in fact, require large quantities of radioactive material and explosives. The dispersion of radiological material by means of an explosion or simply by releasing it into the environment would be subject to some of the same constraints (e.g., water treatment, monitoring, and dilution effect) facing some chemical or biological agents. Nevertheless, given the widespread public anxiety about nuclear material in any form, the mere threat of such use of

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(6) World Nuclear Association, *Radioactive Waste Management*, London, http://www.world-nuclear.org/education/wast.htm. Further information on the categories of radioactive waste as well as their management and other related issues is also available at that Internet site (date accessed: 11 January 2002).

(7) Low-Level Radioactive Waste Management Office, *Inventory of radioactive waste in Canada*, Ottawa, 1999.

(8) Blair (2001).

(9) *Ibid.*

radioactive materials could be a potent terrorist tool. The same comment is applicable to attacks on nuclear power facilities or on shipments of nuclear materials, which threaten some degree of radioactive release.

B. Attacks on Nuclear Facilities

A terrorist attack on a nuclear power plant using a commercial jet or heavy munitions could have a similar effect to a radiological (dirty) bomb, but could cause far greater casualties. The targets for such attacks would be primarily nuclear plants and sites, but nuclear research laboratories and waste disposal sites could also be targeted. If such an attack were to cause either a meltdown of the reactor core (similar to the Chernobyl disaster), or a dispersal of the spent fuel waste on the site, extensive casualties could be expected. In such an instance, the power plant would be the source of the radiological contamination, and the plane or armament would be the explosive mechanism for spreading lethal radiation over large areas.

National and international authorities responsible for nuclear power plant safety – such as the Canadian Nuclear Safety Commission (formerly the Atomic Energy Control Board), the U.S. Nuclear Regulatory Commission, and the International Atomic Energy Agency – have contemplated these issues since the terrorist attacks of 11 September 2001.(10) Until then, the possibility of attacks on nuclear facilities using private or commercial airplanes was not considered significant. Nuclear power plants have the most robust engineering of any buildings in the civil sector and are built to withstand extreme events such as hurricanes, tornadoes and earthquakes. However, they were not designed to withstand impacts from commercial airliners. In any case, nuclear reactors would automatically shut down in most cases. In Canada, the nuclear reactors have been designed with redundant safety systems, such as diverse and separate cooling systems, in order to ensure continuous cooling of the core in the event of an incident.(11) Nevertheless, no-fly zones over possible targets worldwide have either been established or extended. In Canada, the AECL already prohibits any flight at an altitude lower than 3,000 feet and within a 3.5 nautical mile radius from its Chalk River site. Another common suggested course of action is to defend some nuclear facilities with surface-to-air missiles as has already

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(10) Canadian Nuclear Safety Commission (CNSC), *FAQs: Nuclear security in Canada*, Ottawa, 2001, http://www.nuclearsafety.gc.ca/eng/media/speeches/faq.htm.
U.S. Nuclear Regulatory Commission, *NRC reacts to terrorist attacks*, Washington, D.C., 2001, http://www.nrc.gov/reading-rm/doc-collections/news/archive/01-112.html.
Mark Henderson, "Nuclear reactors vulnerable to attack," *The Times*, London, 27 September 2001, http://www.thetimes.co.uk/article/0,,2001330019-2001334212,00.html.

(11) CNSC, *FAQs: Nuclear security in Canada* (2001).

been done in the Czech Republic.[12] In the wake of September 11, the Canadian Nuclear Safety Commission adopted a number of measures to enhance security at nuclear facilities in coordination with the concerned provincial power generation authorities. One of those is to provide the capability for an immediate armed response on the site of the power reactors.[13] The other measures address concerns over security screening (ID checks, personnel and vehicle searches, clearance of employees and contractors).

C. Nuclear Bombs

The threat from radiological dispersion appears less terrifying when compared to the possibility that terrorists could build or obtain an actual atomic bomb. Even an explosion of low yield could kill hundreds of thousands of people. A relatively small bomb of approximately 15 kilotons detonated in a large urban centre could immediately kill upwards of 100,000 inhabitants, followed by a comparable number of deaths in the lingering aftermath.[14]

When assessing terrorists' capability to build nuclear weapons, one must consider the following factors: the type of device and level of sophistication; the time and expertise available; and the ability to divert fissile nuclear material. When building a nuclear device, there are two applicable design principles: crude design, and a sophisticated design.

- A crude device is one employing either of the methods used at the end of World War II: the gun type or the implosion type. The first type involves two subcritical amounts of fissile material brought together at high speed in a gun barrel to reach a supercritical state, while the second type requires that a sphere made of a subcritical amount of fissile material be compressed to supercriticality by a symmetrical implosion shock wave. Such bombs would be quite heavy (at least 1 ton) and large.
- A small sophisticated design would involve a smaller bomb weighing one hundred to a few hundred pounds and it would be easily transportable. This design is based on more than 50 years of top-secret research, and involves teams of experts from various fields and extensive testing capability.[15]

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(12) Henderson (2001).

(13) Canadian Nuclear Safety Commission, *Backgrounder: CNSC action on nuclear safety post September 11, 2001*, Ottawa, 2001, http://www.cnsc.gc.ca/eng/media/speeches/back.htm.

(14) Blair (2001).

(15) Carson Mark, Theodore Taylor, Eugene Eyster, William Maraman and Jacob Wechsler, *Can Terrorists Build Nuclear Weapons?* Nuclear Control Institute, Washington, D.C., http://www.nci.org/k-m/makeab.htm (date accessed: 11 January 2002).

The fabrication of a bomb of crude design would be possible if a number of requirements are met. Such an effort would have to rely on a team with technical knowledge and expertise. The amount of fissile material required would tend to be large (estimated to be at least 20 kg plutonium or 50 kg uranium[16]), so terrorists would have difficulty acquiring sufficient material to proceed. The potential hazards in such an operation are numerous, arising from handling explosive and highly radioactive material without specialized facilities or equipment. Finally, the terrorist group would have to achieve a rapid turnaround because the likely detection of a theft of any significant amount of fissile material would trigger an intensive worldwide investigation.[17]

It is generally recognized that the production of sophisticated devices is an unlikely activity for a terrorist group that is not operating in the context of a nationally supported program able to provide the necessary resources and facilities.[18] Although the ability to steal an operable weapon is still a threat, such weapons are heavily guarded. Similarly, bomb-grade fissile nuclear material (highly enriched uranium or plutonium) is relatively well guarded in most, if not all, nuclear weapon states. Nonetheless, the possibility of diversion remains. A primary source of diverted weapons or material could be Russia. Another potential source of diversion is Pakistan's nuclear arsenal, estimated to number about 30-50 atomic bombs with explosive yields ranging from 1 to 15 kilotons.[19]

Regardless of the type of bomb and its nominal power, the effects of a nuclear explosion would be devastating.[20] Flying debris and radiation would kill many exposed people within a half-mile of the blast's epicentre. The Electro Magnetic Pulse (EMP) produced would destroy every electronic device within a significant radius, including cars, cell phones, computers and ATMs. Victims would be exposed to ionizing radiation and subatomic particles. These radiations and particles hit and kill individual cells in the victim's body, damaging their DNA. The resulting radiation poisoning is a condition in which so many cells die in the body that their ensuing decay poisons the victim. This situation is similar to what happens with radiation

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(16) Anet (2001).

(17) Mark *et al.* (2002).

(18) *Ibid.*

(19) Blair (2001).

(20) Samuel Glasstone and Philip J. Dolan (eds.), *The effects of nuclear weapons*, 3rd edition, United States Department of Defense and Energy Research and Development Administration, Washington, D.C., 1977, available on the website of the Federation of American Scientists, http://www.fas.org/nuke/trinity/nukeffct/enw77.htm.

treatment for cancer where radiation is used to kill only cancerous tissue, except that the whole body get irradiated for more extended periods of time.

Radioisotopes produce radiation in three forms: alpha particles (a cluster of two photons and two neutrons); beta particles (high-energy electrons); and gamma radiation (high-energy photons).(21) Skin will stop alpha particles, and clothing or a sheet of newspaper will stop most beta particles. However, significant damage can result in exposed areas of the body, such as the eyes, or from inhalation of contaminated dust. Gamma radiation – which is made up of particles that travel like light or radio waves – creates damage similar to that caused by alpha and beta particles. However, these particles are much more penetrating, therefore they go all the way through the victim's body. Gamma radiation is more efficiently stopped by denser material such as lead.(22)

D. Summary and Assessment of Nuclear Threats

Table 1. Assessment of the Risks Associated with Nuclear Terrorism Threats(23)

Threats	*Technical feasibility*	*Effects and damages*			*Risk*
		Area affected	*Human*	*Environment and economy*	
Radiological dispersion bomb	Difficult but feasible	Local	Small to medium	Large, particularly on the economy	Medium
Attacks on nuclear facilities	Security makes it difficult	Very large (>100 km^2)	Dependent on the target	Very large	Very low
Nuclear bombs	Extremely difficult	Large (>50 km^2)	Very large to catastrophic	Disastrous	Extremely low

NUCLEAR ACTIVITIES IN CANADA

The above overview of the various nuclear terrorist threats highlights the necessity for a complete inventory of all nuclear activities in Canada. Because of the broad and diversified nature of these activities in this country, the potential for non-secure sources of radioactive material is great. In Canada, the Canadian Nuclear Safety Commission (CNSC), is responsible for overseeing all nuclear-related activities. The Commission's mandate is to

(21) World Nuclear Association (2002).

(22) Glasstone and Dolan (1977).

(23) Anet (2001).

regulate the development, production and use of nuclear energy, as well as the production, possession and use of nuclear substances, regulated equipment and sensitive information in Canada. The CNSC also has the role of implementing measures respecting international control of the use of nuclear energy and substances. A brief summary of the nuclear activities in Canada is presented below. This information is available through the CNSC's annual report[24] and its other publications.

A. Nuclear Facilities

All nuclear facilities are required to operate under a CNSC license.[25] Canada's 22 power reactors are divided among five sites owned by three provincial electric utilities. Ontario owns 20 reactors on three sites, while Quebec and New Brunswick each own 1 reactor.[26] Eight research reactors operate at various universities or research centres,[27] one of which has used bomb-grade uranium in the past. As well, AECL reactors at Chalk River Laboratories are operating under CNSC licenses.

Table 2. CNSC-licensed Nuclear Facilities in Canada

Activities	*Number*	*Comment*
Power reactors	22	
Heavy water plants	1	Location: Darlington
Research reactors	7	Plus 1 decommissioned reactor
Nuclear research and test establishments	2	AECL facilities
Large irradiators	3	
Medical particle accelerators for radiation therapy	154	30% increase since 1999
Non-medical particle accelerators	20	
Nuclear substance processing facilities	3	
Uranium mine facilities	17	5 operating in SK and 12 shutdown or decommissioned
Uranium processing and fuel fabrication facilities	6	

(24) Canadian Nuclear Safety Commission, *Annual Report 2000-2001*, Ottawa, 2001, http://www.cnsc.gc.ca/eng/whois/ar00-01_e.pdf.

(25) *Ibid.*

(26) Low-Level Radioactive Waste Management Office (1999) and Canadian Nuclear Safety Commission (2001), *Annual Report 2000-2001*.

(27) Low-Level Radioactive Waste Management Office (1999).

B. Nuclear Waste

Nuclear facilities and users of regulated substances produce radioactive waste. The radioactive content of this waste varies with the source, and management techniques depend on the characteristics of the waste. As of March 2001, there were 19 licensed waste management facilities operating in Canada. The activities covered by these licenses pertained to:

- reactor waste;
- underground disposal facilities;
- refinery waste;
- radioisotope waste (includes research and medicine radioisotopes);
- historic waste; and
- decommissioning.

C. Other Users of Nuclear Material

CNSC licenses are also required for the possession, sale or use of nuclear materials. There are 23 regulated substances licenses for uranium, thorium and heavy water (19 companies). Licensed activities include:

- possession and storage;
- analysis;
- research;
- experimental detection of solar neutrinos; and
- a wide variety of commercial uses.

A number of other activities require the use of radioisotopes. As of March 2001, a total of 3,461 radioisotopes licenses issued by the CNSC were in effect. These licenses covered:

- research;
- medicine for diagnostic and therapeutic purposes;
- industrial tasks involving quality and process control; and
- manufacturing, distribution and importation of devices using small amounts of radioisotopes such as smoke detectors.

D. Transportation of Radioactive Material

In Canada, more than 1 million packages of radioactive material are assembled and transported each year. CNSC regulates this area in conjunction with Transport Canada. Between March 2000 and March 2001, a total of 19 incidents were reported, such as improperly prepared packages, incorrect labelling documentation or markings, misplaced or temporarily lost packages, and one package which was involved in a fire.

It should be noted that among the radioactive material packages transported in and exported out of Canada are Cobalt-60 sources, produced here by one of the major worldwide manufacturers, MDS-Nordion (Kanata and Chalk River, Ontario). Cobalt-60, required for industrial irradiation applications, is also one of the radioisotopes of choice for the fabrication of radiological dispersion bombs.

TREATMENT OF CASUALTIES

Terrorist incidents involving radiological/nuclear materials would entail the following primary hazards: illness or death from close contact with a highly radioactive source; increased risk of cancer over a lifetime from moderately active, dispersed sources; and psycho-social trauma. Treatment of victims would be greatly hampered by inadequate medical facilities and training. In Canada, the emergency response plans of each nuclear power facility identify a local hospital to handle the treatment of radioactively contaminated casualties in the event of a nuclear accident.(28) It is assumed that such a contingency plan would also apply to casualties from the explosion of a nuclear device. However, it is unknown whether these hospitals could handle the potential number of victims and still protect hospital workers. Moreover, only one major hospital in Canada – Toronto Western Hospital,(29) part of Toronto's University Health Network – is dedicated to the treatment of radioactively contaminated casualties. In the United States, only one hospital emergency room – located at Oak Ridge, Tennessee – is dedicated to treating patients exposed to radiation hazards.(30) This facility, the Radiation Emergency Assistance Center/Training Site (REAC/TS), also serves as a training site designated by the

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(28) Environmental Health Directorate of Health Canada, *Radiation Protection*, Ottawa, 2001, http://www.hc-sc.gc.ca/ehp/ehd/rpb/.

(29) Toronto Western Hospital, *Homepage*, University Health Network, Toronto, http://www.uhn.ca/front_pages/twh_home.htm (date accessed: 11 January 2002).

(30) Blair (2001).

World Health Organization for assistance worldwide in the development of medical emergency plans to address large-scale radiation accidents and provide training in the handling of radiation accidents.[31] REAC/TS, which is on-call 24 hours a day, has responded to numerous foreign radiation accidents such as:

- diagnostic evaluation of ten persons following rupture of an Iridium-192 source in Venezuela;
- on-site health physics assistance following leakage of a Radium-226 implant source at a hospital in Jamaica;
- medical consultation, cytogenetic dosimetry, and follow-up after a Cobalt-60 therapy unit accident in Mexico; and
- medical consultation, radiological monitoring, cytogenetic dosimetry, and assistance in establishing patient follow-up in the Cesium-137 accident in Brazil.

More recently, REAC/TS has provided medical consultations following accidents in El Salvador, Japan, and Peru. No such accidents have happened in recent years in Canada. However, Canada would be able to seek assistance from REAC/TS, in the event of an accident.[32]

GOVERNMENT RESPONSE

Canada has four national response plans that would be activated individually or in combination following a terrorist incident involving chemical, biological or nuclear materials. They are:

- The Federal Nuclear Emergency Plan (Health Canada);
- The National Counter-Terrorism Plan (Solicitor General Canada);
- The Food and Agriculture Emergency Response System (Agriculture and Agri-Food Canada, and the Canadian Food Inspection Agency); and

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(31) Oak Ridge Institute for Science and Education, *Radiation Emergency Assistance Center/Training Site*, Oak Ridge, Tennessee, 2001, http://www.orau.gov/reacts/intro.htm.

(32) Environmental Health Directorate of Health Canada (2001).

- The National Support Plan (Office of Critical Infrastructure Protection and Emergency Preparedness).

The Federal Nuclear Emergency Plan (FNEP) applies to four main categories of events,[(33)] including:

- serious accidents at nuclear facilities in Canada, or along the Canada/United States border;
- accidents involving nuclear-powered vessels visiting Canada or in transit through Canadian waters;
- events involving a nuclear facility in the remainder of the United States or in a foreign country; and
- other serious radiological events, including malevolent acts involving improvised nuclear or radiation dispersal devices, or the re-entry of nuclear-powered satellites.

Threats can arise from accidents at facilities in Canada, the United States and abroad. The Federal Nuclear Emergency Plan would not normally apply to local incidents at licensed nuclear facilities or to transportation accidents in Canada that are within the response capabilities of industry, regulatory agencies, or the province, unless the latter specifically requests federal aid, or if the accident has trans-boundary implications. In the event of a major nuclear emergency at a Canadian licensed facility, the utility as well as regional, provincial and federal governments would all activate their Emergency Operation Centres (EOCs). These EOCs are linked to each other and to the CNSC, and are in liaison with the international community and neighbouring U.S. states.

Federal resources available to respond to terrorism involving chemical, biological or radiological/nuclear threats include teams from the RCMP, the Canadian Forces (the Nuclear, Biological and Chemical Response Team[(34)]), the CNSC, and authorities (departments or agencies) in the areas of transport, environment, health and agriculture. As well, provincial and municipal resources – such as police, firefighter and HAZMAT (hazardous materials) teams,

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(33) Health Canada, *The Federal Nuclear Emergency Plan*, Ottawa, 2000, http://www.hc-sc.gc.ca/ehp/ehd/rpb/environ/fnep/index.htm.

(34) This specialized unit was recently criticized for its inadequate level of preparedness in the event of a sudden terrorist attack in the Ottawa area (Rick Mofina, "Military ill-prepared for attack on Ottawa: Response team based near Toronto would take 14 hours to set up in capital," *The Ottawa Citizen*, 11 January 2002).

hospitals, health authorities, ambulance and emergency medical services (EMS), search and rescue teams, and various departments – are responsible for various emergency response plans. In addition, all provinces have radiation protection programs capable of providing some assessment of a radiological/nuclear incident. Ontario, Quebec and New Brunswick have detailed nuclear emergency response plans and programs to respond to accidents at nuclear power facilities in their respective jurisdictions. It is expected that these programs could provide expertise and response capability for terrorist incidents involving nuclear or radiological materials.[35]

In a 2001 discussion paper,[36] the Solicitor General of Canada followed up on the Government's response to the 1999 report of the Special Senate Committee on Security and Intelligence. The Solicitor General made the following assessments concerning Canada's level of preparedness in response to radiological/nuclear terrorism:

- Firefighters and HAZMAT personnel are adequately protected from inhalation risks and external radiation exposure by beta- and alpha-emitting radionuclides. However, they are not protected from gamma-emitting sources.
- Police and EMS have no protective equipment.
- Although the capability to detect or identify radioactive material is available, it is not located with first responders.
- Decontamination expertise rests with selected provincial/federal authorities and with industrial, medical and educational organizations which own radiological sources.
- There is no national generic radiological/nuclear terrorism municipal response model to guide police, firefighters, EMS and local authorities in the development of local plans, inter-agency cooperation and coordination, and operational protocols.

CONCLUSION

Recent events have propelled security concerns to the very top of the agenda of every legislature in the world. The probability of nuclear terrorist threats – such as the ones outlined in this paper, particularly that of radiological terrorism (dirty bomb) – is low but not

(35) Solicitor General Canada (2001).

(36) *Ibid.*

nonexistent. The international community must seriously address the issues pertaining to nuclear terrorism, which could be the ultimate form of terrorism. The issues and challenges are numerous and complex. The main challenges facing Canada relate to strengthening our emergency preparedness plans and our response to terrorist threats, and ensuring that all nuclear material and waste is appropriately secured thus preventing actual threats. The primary objective of the brief overview of the nuclear activities in Canada presented in this paper was to identify potential sources of such material and waste. The paper has also identified the national emergency plans and resources throughout the country designed to respond to nuclear threats. Canada's counter-terrorism capability has been criticized in the past. In its response to the Special Senate Committee on Security and Intelligence, the government of Canada has committed to developing strategy to strengthen counter-terrorism capability and emergency preparedness. Gaps in these abilities were in fact identified in the 2001 Solicitor General paper, which is now open for discussion, comments and suggestions from various stakeholders nationwide.