

Canadian
Forces
College

Collège
des
Forces
Canadiennes



EFFECTS AT A COST: INEFFICIENCY IN CANADIAN DOMESTIC CBRNE RESPONSE

Major A. Cornect

JCSP 37

Master of Defence Studies

Disclaimer

Opinions expressed remain those of the author and do not represent Department of National Defence or Canadian Forces policy. This paper may not be used without written permission.

© Her Majesty the Queen in Right of Canada, as represented by the Minister of National Defence, 2011, 2014.

PCEMI 37

Maîtrise en études de la défense

Avertissement

Les opinions exprimées n'engagent que leurs auteurs et ne reflètent aucunement des politiques du Ministère de la Défense nationale ou des Forces canadiennes. Ce papier ne peut être reproduit sans autorisation écrite.

© Sa Majesté la Reine du Chef du Canada, représentée par le ministre de la Défense nationale, 2011, 2014.

CANADIAN FORCES COLLEGE – COLLÈGE DES FORCES CANADIENNES
JCSP 37 – PCEMI 37
2010 – 2011

MASTER OF DEFENCE STUDIES – MAÎTRISE EN ÉTUDES DE LA DÉFENSE

**EFFECTS AT A COST: INEFFICIENCY IN CANADIAN DOMESTIC CBRNE
RESPONSE**

By Major A. Cornect

“This paper was written by a student attending the Canadian Forces College in fulfilment of one of the requirements of the Course of Studies. The paper is a scholastic document, and thus contains facts and opinions, which the author alone considered appropriate and correct for the subject. It does not necessarily reflect the policy or the opinion of any agency, including the Government of Canada and the Canadian Department of National Defence. This paper may not be released, quoted or copied, except with the express permission of the Canadian Department of National Defence.”

Word Count: 12 906

“La présente étude a été rédigée par un stagiaire du Collège des Forces canadiennes pour satisfaire à l'une des exigences du cours. L'étude est un document qui se rapporte au cours et contient donc des faits et des opinions que seul l'auteur considère appropriés et convenables au sujet. Elle ne reflète pas nécessairement la politique ou l'opinion d'un organisme quelconque, y compris le gouvernement du Canada et le ministère de la Défense nationale du Canada. Il est défendu de diffuser, de citer ou de reproduire cette étude sans la permission expresse du ministère de la Défense nationale.”

Compte de mots : 12 906

Abstract

In the ensuing decade since 9/11, the global business of Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) has blossomed and continues to thrive in large part due to the instability generated by terrorism. Canada also has fallen into this trend, by growing a vast, inefficient CBRNE capability with flaws that must be addressed if it is to be maintained. Canadian law, Canadian government strategy, and existing plans clearly outline roles and responsibilities that agencies and departments have interpreted loosely to secure footing on the political stage. Public Safety's delivery of a detailed Action Plan to enact a Resilience Strategy has created the conditions for future success, but implementation will take time to create a truly efficient model. Approaching fiscal realities have created opportunities for agencies to create opportunities to secure funding and resources by generating inefficient, highly visible capabilities that have limited value. Scientific support needs to be focused on partnering with CBRNE responders to avoid redundancy and ensure complimentary effects are achieved to deliver the best possible capability.

Introduction

On Monday, 14 April 2013 the latest terrorist attack in North America resulted in 3 killed and at least 183 injured at the site of the Boston Marathon. Among the dead was an 8 year-old boy. Of the injured 13 lost limbs due to the blast or subsequent medical amputation.¹ Despite rigorous site screening and control measures designed to secure the race site, security measures still failed to prevent the placement of two improvised explosive device. Constructed from common materials (approximately the size of a pressure cooker), these two small devices had a significant physical and psychological effect. Had the devices been Chemical, Biological, or Radiological in nature, the effect could have been exponentially worse. More than 2078 Canadians were participating in the event.² This attack was only the latest successful attack, and for every successful attack, there are many failed attempts. Four days later on 18 April, Paul Kevin Curtis was arrested by the FBI for sending two letters suspected of containing ricin to President Barack Obama.³ Even with the dramatic enhancements and massive investments in safety and security, arguably the most powerful nation on the planet finds itself yet again the victim of terrorism. These most recent reminders clearly demonstrate that terrorism is a real and present danger and despite more than a decade of war on terrorism, threats can manifest themselves without warning.

Just across the border in Canada serious consideration must be given to the potential terrorist threat to Canada and the possibility of Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) weapons being used in an attack. After decades of neglect, the CBRNE community in Canada faces an ongoing struggle to prove its value to Canadian security. Most people, including senior leaders in government, defence, and security, assume that the existing measures are more than ample, or the means to create CBRNE weapons simply do not exist. Although the actual threat to Canada is not necessarily understood by the populace, the Government of Canada (GoC) has given direction to ensure Canada and Canadians are safe and secure. These measures include the creation and maintenance of an effective, large, and robust

¹ Greg Botelho, "Mourning, resolve and quest for answers after deadly Boston Marathon bombs", (*CNN Website*, 17 April, 2013).

² Ibid.

³ Ewen MacAskill, "'Ricin' letters: Man arrested in connection with packages sent to Obama and Wicker", (*The Guardian*, 18 April, 2013).

CBRNE response capability that brings together assets from municipal, provincial, and federal levels in a Whole of Government (WoG) effort. Although this CBRNE capability has been generated and effectively employed to prepare and respond to terrorism, current fiscal restraints and the shrinking pool of resources available to all levels of government, has forced leadership to examine the question of how efficient is the capability. This essay will demonstrate that the WoG domestic CBRNE response capability in Canada is inefficient.

Efficiency governs capability and capacity. Approaching fiscal realities has made the efficiency of capabilities a prevalent issue for the CBRNE community and the WoG agencies that form its nucleus. This discussion will focus on the core issues and cover the mandates, assets, standards, resource management, and how operationalizing science has become both a solution and cause of inefficiency in Canada's CBRNE response capability. Mandates, or rather the drifting of mandates, will be traced to their roots in Canadian law, the Canadian government's strategy, and existing plans. Assets will be categorized using current examples, including the standards that are applied to them in order to ascertain their fit, form, and function. Resource management will also be discussed to highlight potential problems and examine potential solutions. Finally, the concept of operationalizing science will be presented as a means to measure the utility and efficiency of the scientific community's continually evolving role in Canada's WoG domestic CBRNE response capability. To frame discussion of CBRNE response capability, it is essential to have background on the potential threat to Canada and Canadians from CBRNE terrorism.

The Contemporary Threat Environment

Having never had a large scale terrorist attack executed within Canada, there is a misconception that security can be derived from the fact that terrorism did not, and therefore will not affect Canada or Canadians. Even with the recent poignant events suffered by the US serving as reminders that the threat of terrorism remains, there are some common misconceptions regarding Canadian security and the threat posed by CBRNE terrorism. Most Canadians are not aware of the fact that their country is vulnerable to terrorism and that CBRNE weapons are a deadly, easily obtainable, and likely means of attack. The nature of CBRNE threats, the proliferation of information, and the availability of material, have made CBRNE terrorism a very real threat to

Canada. The problem is that most Canadians are ignorant or misinformed about national security and have to be educated on the contemporary threat environment. To understand the domestic security environment, Canadians must first understand that Canada is not immune from terrorism. As put forward by Jez Littlewood, Nathalie Kauffeldt and Adam Kanyz, there are three key issues to be considered regarding the reality and the perception of terrorist threats to Canada.⁴

First, there is no history of a sustained political violence against Canada or in Canada. It is true that Canada does not have a history of being targeted by sustained political violence. However, the decade of operations in Afghanistan and recent operations in support of Mali and in Libya has had an effect on a generation of Canadians.⁵ Canadians are more aware of the global security environment, and that the threat of extremists and terrorism is more prevalent. The threat to Canada and Canadians has manifested itself repeatedly abroad and at home.

Second, Canadians have been killed and injured as a result of terrorism. Canadians, Canada, and national infrastructure are likely to continue to be targets for terrorists. Although 9/11 signalled a change in the global security environment, Canada has been targeted by a variety of attacks over the past 40 years. These acts of terrorism mostly occurred outside of Canada but included attacks on diplomats, airline bombings, and attacks on embassies.⁶ In 2006, the threat was made evident. Law enforcement authorities conducted the most significant counter-terrorism operation in Canadian history, which led to the arrest of the terrorist network known as the Toronto 18.⁷

Third, terrorism-related activities, such as financing and acquisition of resources to support terrorism, are being conducted in Canada and will likely continue to be in the future. Supporting activity such as financing of terrorism is conducted discreetly and the terrorists themselves are in general average people.⁸ Seemingly ordinary people who grew up in Canada can come to reject Western, liberal, and democratic values that form the foundation of the Canadian identity, and

⁴ Jez, Littlewood, Nathalie Kauffeldt, and Adam Kanyz, "Perceptions and Realities of Terrorist Threats: Government, Institutional, and Social Responses", (*The Bridge*, 23 August, 2010), 1-2.

⁵ Thomas Walkom, "Canadian troops drawn into Mali's war, despite what Prime Minister Stephen Harper says", (*The Star*, 29 January, 2013).

⁶ Littlewood, Kauffeldt and Kanyz, 3-5.

⁷ Canadian Security Intelligence Service, *Public Report 2010-2011*, (Ottawa: Public Works and Government Services Canada, 2012), 12.

⁸ CSIS, 15.

replace them with anti-Western ideology.⁹ In this manner, a variety of groups and organizations directly or indirectly engaged in terrorism have complete access to Canada and Canadians.

CBRNE Terrorism

Terrorists have a wide variety of weapons at their disposal, and the potential of CBRNE weapons cannot be overlooked. The Canadian Security Intelligence Service (CSIS) describes CBRNE weapons, commonly referred to as weapons of mass destruction (WMD), and their dispersal methods as a significant threat to national security, its allies and the international community.¹⁰ The proliferation of materials and knowledge related to WMD by state or non-state actors is a significant threat to Canada. Regardless of whether proliferation is carried out by state or non-state actors, the pursuit of WMD increases global tensions and may even precipitate armed conflicts. Canada's science and technology community leads many high technology areas, and CSIS continues to investigate attempts to procure Canadian WMD-related technology, materials and expertise within or through Canada.¹¹ Terrorist groups including Al Qaeda, have pursued efforts to use CBRNE materials as WMD, including use of toxic industrial chemicals, biological agents such as anthrax, Home Made Explosives (HME), and Improvised Nuclear Devices (IND).

While the probability of a highly technical threat, using extremely rare materials such as an IND are extremely low, the consequences of such an event would be devastating.¹² The destabilization of Syria has significantly affected the global security environment as the questionable control of state chemical and biological warfare programs increase the likelihood of the proliferation of materials and warfare agents.¹³ Similarly, global smuggling networks have enabled the proliferation of even highly controlled materials including special nuclear material.¹⁴ The more likely possibility is that a terrorist group could acquire crude capabilities of an unsophisticated nature, such as the use of chemicals, toxins, bacteria, or radioactive material in large or small-scale attacks. As highlighted by CSIS in its annual report, using available

⁹ Littlewood, Kauffeldt and Kanyz, 8.

¹⁰ CSIS, 16.

¹¹ Ibid.

¹² Graham Allison, *Nuclear Terrorism: The Ultimate Preventable Catastrophe*, (New York: Henry Holt and Company, 2005), 15-18.

¹³ Jessica Yellin, "Israeli Minister: It's clear that chemical weapons were used in Syria", (*CNN*, 20 March, 2013).

¹⁴ Matt Chorley, "Dirty bomb attack now a 'real threat' to Britain as nuclear waste smugglers swap tips online Foreign Office warns", (*Mailonline*, 1 November, 2012).

knowledge and readily available materials, a group or an individual could achieve economic and psychological effects.¹⁵ Even small scale attacks would be effective in creating terror without necessarily producing a significant number of casualties as evidenced in the recent Boston Marathon attack.¹⁶ All that is required is the key components of knowledge and material to provide the means for a CBRNE terrorist attack.

Components of the CBRNE Threat

The proliferation of CBRNE knowledge is the prime component that decides the scope, scale, and probability of any potential CBRNE threat. The availability of knowledge has long been a topic of concern and speculation by the media, security specialists and the responder community. A wide variety of sources has been made available through the internet, government and privately published books and reports on the subject. Dozens of groups and authors ranging from disgruntled citizens to militia or terrorist groups have already accessed the requisite knowledge and have been disseminating it for some time.¹⁷ The work of some of the more prolific and notorious authors have become well known to the CBRNE community. One example is Mr. Steve Preisler, an industrial chemist employed in a factory.

As a university graduate with a degree in chemistry and biology, Preisler produced a series of books after being incarcerated for methamphetamine possession and the purchase of large quantities of precursors required for the production of methamphetamine. Using the nom de plume of Uncle Fester, Preisler first gained notoriety with his first book *Secrets of Methamphetamine Manufacture* in the early 1980s, and from that point on his work was more threatening in nature. His subsequent titles focused on the creation of CBRNE threats from items available to the general public using techniques researched from academic studies, scientific papers, and other open sources. In *Home Workshop Explosives* offered detailed instructions on techniques and recipes for the manufacture of HME.¹⁸ A later work, *Silent Death*, published in 1997, focuses on a wide range of chemical and biological agents. The book

¹⁵ CSIS,16.

¹⁶ Botelho.

¹⁷ Anne Marie Helmenstine, "The Myth About Learning How to Make Ricin from the Internet", (*About.com Chemistry*, 29 February, 2008).

¹⁸ Chip Smith, "Coffee or Something Stronger: An Interview with Uncle Fester". (*The Hoover Hog*, 29 July, 2013).

describes the types of substances that would be suitable to incapacitate or kill, and the means for delivering threat agents to a target without being detected.¹⁹ These books are readily available from a variety of suppliers for less than \$20, and represent only one source of information required to create a potential threat agent.

There is ongoing debate as to the accuracy of the information available through media or sources such as Uncle Fester and those like him.²⁰ The sheer volumes of information available through open sources are seldom referenced and there is doubt by the scientific community that the do-it-yourself approach could be used successfully or safely.²¹ However, if the material is well researched and referenced against academic sources, a person with the requisite skills and training could easily produce a viable threat. Threats can therefore be fabricated by individual or groups provided they have access to the other key component of suitable raw material. Unfortunately, the material components required to make use of proliferated knowledge are readily accessible from a variety of sources in surprising variety and quantity. Although large quantities are tracked, a group or individual could remain undetected by accruing a quantity of material over time or acquiring a large quantity rapidly from a number of vulnerable sources in Canada.

Potential Forms of Attack

Some forms of attack include the use of Toxic Industrial Chemicals (TICs) found commonly in industry, naturally occurring bacteria or toxins, controlled pathogens, and radiological sources. Large volumes of chemical warfare agents do not have to be synthesized or transported into Canada as they are already present in vast quantity and are routinely shipped throughout the country. Two examples of the typical TICs are phosgene and chlorine. Although they are deadly chemical warfare agents, they are used in industry and are transported to and from industrial facilities for storage or transfer. To make matters worse, these facilities are typically in close proximity to major cities. Thousands of 90-ton rail cars filled with TICs, such as chlorine, pass through or near enough to major cities such as Vancouver every year to pose a

¹⁹ Uncle Fester, *Silent Death. (Revised and Expanded second Edition)*, (Green Bay: Festering Publications, 1997), 20-36.

²⁰ Helmenstine.

²¹ Ibid.

serious potential threat.²² An attack on a large tanker in a city would have a devastating effect. The release of chlorine in the quantity contained within a single rail car would kill or incapacitate people within several kilometres of the spill. Even if the effect is unintentional, the effect of an accidental release or chemical reaction of substances can also be devastating. The fertilizer factory explosion on 18 April, 2013 levelled homes in a 5 block radius in Waco, Texas, killing as many as 15 people without warning and was not a result of a terrorist act.²³ Nonetheless, the residents of the small town suffered from a massive explosion that could be replicated under the right circumstances in or near a Canadian city. As a WMD, TICs present the greatest potential of producing mass effects with immediate results.

There are several endemic diseases, natural toxins, and controlled stores of pathogens that exist in Canada and North America that can harm or kill. Bacterial threats such as anthrax occur naturally in the environment and relatively large quantities can be grown with the requisite knowledge and skill. Toxins can be derived from a variety of sources, such as plants and animals, although in relatively small quantities. The recent attempted delivery of ricin to the President of the United States clearly demonstrates the ability of individuals or groups to create viable threat agents.²⁴ Furthermore, even controlled pathogens held within secure facilities including deadly hemorrhagic fever can go missing in North America.²⁵ While transmissible agents would have a large scale effect; potentially triggering a pandemic, bacterial agents and toxins would most likely have localized effects. The challenge of effectively producing the agent and effectively dispersing it in the concentration, quantity and conditions necessary to cause mass effect would be nearly insurmountable.²⁶ However, the effect on the medical system by people who believe to have been exposed and the psychological impact on the population created by even an ineffective attack cannot be understated. As an instrument of terror, biological agents present the greatest potential for psychological effect on the populace.

²² Linda Solomon, "Hazardous chlorine leak in North Vancouver", (*Vancouver Observer*, 2 March, 2011).

²³ Amanda Holpuch, Peter Walker and Warren Murray, "Texas explosion: up to 15 dead after fertiliser plant blast", (*The Guardian*, 18 April, 2013).

²⁴ MacAskill.

²⁵ Torie Bosch, "Missing Vial of Dangerous Virus Highlights Security Problems at U.S. Labs", (*Slate*, 25 March, 2013).

²⁶ Judith Miller, Stephen Engelberg and William Broad, *Germs: Biological Weapons and America's Secret War*, (New York: Touchstone, 2002), 326.

The threat of a nuclear device has been considered at length due to the magnitude of the consequences of an IND attack.²⁷ Although the consequences would be catastrophic, the reality is that the quantity of special nuclear material (SNM) required would be exceptionally difficult to obtain. Smuggling material into Canada increases greatly the potential for detection even if SNM could be secured from the global market.²⁸ A far easier method would be the use of radiological sources that regularly go missing in Canada every year from medical or industrial applications. Since 2005, an accurate record of lost radiological source has been kept by the Canadian Nuclear Safety Commission (CNSC) and a total of 90 sources have been reported stolen or lost including 15 in 2012 alone. The lost or stolen sources include 11 very high risk sources.²⁹ Very high risk material has comparatively short range and is not suited to large scale effects. However exposure to the material would likely cause permanent injury and potentially be fatal to a person who handled or was in close proximity with it for a few minutes. Exposure to the unshielded threat for up to an hour would normally be fatal.³⁰ The CNSC report illustrates the potential for theft of sources that could be used in dispersal devices or exposure devices to injure or kill. As a means of killing or injuring, the deliberate exposure of the populace to radiological material is viable option for a small scale CBRNE attack.

Even though Canada has not been the target of a WMD attack, this does not mean that the threat of CBRNE terrorism does not exist. The threat to Canada and Canadians from CBRNE terrorism is a reality and CSIS has assessed that WMD pose a significant threat to Canada. State actors with established WMD programs have failed or are failing, readily accessible CBRNE material can be found in Canada, and groups or individuals have access to knowledge that with the right skills can be used to transform the CBRNE into weapons. As highlighted recently by the United Kingdom's Foreign Office, global trafficking of radiological material has greatly increased the potential threat of dispersal or exposure devices. In the United States, even tightly controlled pathogens have gone missing, and in Canada massive quantities of TICs present a ubiquitous threat to our major cities. While a CBRNE attack may not be agreed upon as the principal threat

²⁷ Allison, 2-6.

²⁸ Chorley.

²⁹ Canadian Nuclear Safety Commission, *Report on Lost or Stolen Sealed Sources and Radiation Devices*, (Ottawa: Government of Canada, 10 December, 2012), 1-17.

³⁰ *Ibid*, 22.

to Canada, terrorism is a threat that has to be addressed and countered using a wide array of national resources.

GoC Direction and Guidance

The government directs readiness and response in the event of natural or man-made disaster ranging from earthquakes and floods to pandemics and terrorism. In order to empower departments and agencies of the government, an elaborate framework rooted firmly in Canadian law exists. The GoC has enacted legislation to ensure that in the event of an emergency, Canada and Canadians can count on an effective response when lives are at stake. Authority derived from this legal foundation enables guidance, strategy and supporting plans that are the framework for the creation and maintenance of CBRNE terrorism response capabilities. Significant measures are in place to ensure that the WoG is prepared for a response to a critical incident either natural or man-made. These measures are governed by Canadian legislation, shaped by a national strategy, and translated into action by a series of plans and formal arrangements at the federal, regional and municipal levels. From the highest levels of government, the Emergency Management Act (EMA) is the touchstone document that articulates the will of government.

The EMA is a result of the GoC's desire to enhance emergency management capabilities and coordination in Canada. The EMA designates the lead agency and defines roles across the WoG by setting out roles and responsibilities for federal ministers with regard to emergency management. The EMA assigns national leadership to the Minister of Public Safety which is responsible for establishing clear direction for emergency management for the GoC.³¹ In order to empower the Minister of Public Safety, the EMA also clearly defines roles and responsibilities for federal Ministers with a view to enhance readiness for all types of emergencies.³² The EMA enables collaborative emergency management by improving information sharing between levels of government and with the private sector. Finally, due to the majority of Canada's population centres being in close proximity to the US border, the EMA authorizes the Minister of Public

³¹ Minister of Justice, *Emergency Management Act*, (Ottawa: Government of Canada, 3 August, 2007), 2-3.

³² *Ibid*, 4.

Safety, in consultation with the Minister of Foreign Affairs, to coordinate a Canadian response to an emergency in the United States.³³

Most emergencies will be responded to initially at the municipal or regional level and therefore the EMA emphasises the need for a robust and reliable regional network to enable effective command, control and coordination. The network includes Emergency Management offices in all of the provinces and territories that are mandated to respond to emerging threats to public safety and security.³⁴ Through processes, systems, facilities, technologies, networks, assets and services, connectivity and regional presences are maintained and synchronized with federal department and agencies. The primary objective of this structure is to enable accurate threat assessment, improving situation awareness, and continued development of preparedness and response capabilities.³⁵ The WoG construct has evolved over time and is empowered under Public Safety to conduct operations in response to suspected or actual CBRNE events. In accordance with GoC guidance, Public Safety is the lead agency mandated to affect domestic response to CBRNE events and therefore has crafted a national strategy.

National CBRNE Strategy

The Minister of Public Safety is responsible for not only counter-terrorism but also counter-CBRNE in Canada and has adopted a strategy that empowers various groups at municipal, regional and federal levels to respond to CBRNE events. The first GoC strategy for terrorism is *Building Resilience Against Terrorism: Canada's Counter-Terrorism Strategy (CCTS)*. The strategy provides direction to the WoG team, identifies the principal players, and defines their roles in broad terms. Designed to synchronize layers of capabilities from various levels of government, the CCTS creates the conditions for federal resources to be aligned with First Responders.³⁶ When a terrorist incident requires assets that are not available within the municipality or region, designated agencies will provide specific capabilities or support.

³³ Public Safety Canada, *Emergency Management Act Backgrounder*, (Public Safety website, 2 August, 2012).

³⁴ Public Safety Canada, *Federal Emergency Response Plan*, (Ottawa: Government of Canada, January 2012), 18.

³⁵ Ibid.

³⁶ Minister of Public Safety, "Launch of Building Resilience Against Terrorism: Canada's Counter-Terrorism Strategy", (Ottawa: Speech, 9 February, 2012).

In the case of a CBRNE event, municipal or regional First Responders are on-site immediately. These teams have finite capacity and capability that can be overwhelmed by the scale, scope or complexity of an event. The strategy acknowledges this and outlines what agencies will be available to assist local response and the roles they play if required. From the WoG, there are six major groups and government departments or agencies that control or direct capabilities that enable domestic CBRNE response. This is accomplished either directly by fielding capabilities or indirectly, through dedicated support ranging from research and development, training or scientific and technical support.³⁷ All activities are conducted under the Public Safety mandate and are synchronized by a national strategy in order to maintain essential linkages and provide additional direction as required in an effort to synchronize WoG CBRNE response.

The Major Players

The RCMP under the strategy is ultimately responsible for the investigation of all terrorist events, including CBRNE events, in Canada. As mandated by Public Safety, all responses to terrorist incidents are led by local law enforcement in cooperation with local emergency response and emergency management authorities. With the exception of large urban centres and the province of Quebec, this will include the RCMP and consist primarily of CBRN Explosive disposal and forensics required for criminal investigation of a terrorist act. Regional teams from the RCMP or provincial police forces will be reinforced or relieved by federal assets if the scope of the problem is beyond the regional or municipal capability.³⁸ The RCMP is the lead for the federal CBRNE response and is supported primarily by the Department of National Defence.

The Public Health Agency of Canada (PHAC) mandate includes the prevention and control of chronic diseases, infectious diseases and preparation for, and response to, public health emergencies.³⁹ Under the CCTS, PHAC will provide bio-surveillance to determine the extent of CBRNE effects post event, and coordinating the public health response to a terrorist incident. PHAC is assigned the responsibility for management of the National Emergency Stockpile

³⁷ Public Safety Canada, *Building Resilience Against Terrorism: Canada's Counter-Terrorism Strategy*, (Ottawa: Government of Canada, 9 February, 2012), 19-22.

³⁸ Ibid, 24.

³⁹ Public Health Agency of Canada, "Mandate", (*Public Health Agency of Canada Website*, 16 June, 2012).

System, containing medical countermeasures against CBR effects for use in mass casualty events. Interpreting its mandate as a requirement to generate a response capability PHAC provides direct support to the federal CBRNE response capability for the identification of biological materials.⁴⁰ A Memorandum of Understanding (MOU) exists between the RCMP and the PHAC to provide dedicated specialist support related to biological threats to the federal response capability led by the RCMP.

Health Canada (HC) will provide monitoring, hazard assessments, and advise on decontamination strategies for CBRNE events as detailed in the strategy.⁴¹ HC is the lead department for coordinating nuclear emergency response by more than fourteen federal departments and six federal agencies. Public Safety's *Federal Emergency Response Plan* (FERP) outlines HC responsibility to facilitate coordination by assigning organizations distinct roles and responsibilities related to planning and response to an emergency involving Canadians at home and abroad. In the event of a terrorist act involving radiological or nuclear devices, FERP's Technical Advisory Group would support WoG response by providing technical and operational advice on potential radiological impacts.⁴² There is no mention of a requirement to generate a response capability or conduct response in the FERP.

Defence Research and Development Corporation of Canada (DRDC) provides subject matter expertise that spans the WoG capabilities that directly supports the CCTS. The individual centers provide unique support under DRDC Corporate that directs a variety of programs in support of CBRNE response. DRDC Ottawa provides radiological expertise and contributes to the federal CBRNE capability with research and development in addition to providing forensic identification of radiological materials. DRDC Suffield provides explosive, chemical and biological expertise and contributes to the federal CBRNE capability with research and development and providing forensic identification of chemical materials. DRDC Valcartier provides electro-optic expertise and contributes to the federal CBRNE capability with research and development of remote and standoff chemical and biological detection and identification capabilities. To synchronize the efforts of the centers with its primary client, a series of Service

⁴⁰ Public Safety Canada, *Building Resilience Against Terrorism: Canada's Counter-Terrorism Strategy*, 24.

⁴¹ Ibid.

⁴² Public Safety Canada, *Federal Emergency Response Plan*, A9.

Level Agreements (SLAs) exist detailing the individual roles and responsibilities of centers.⁴³ There is mandate to generate a response capability or conduct response, but DRDC Suffield and DRDC Ottawa have adopted response roles. Quite the opposite, the mandate of the DRDCs are to support the development of capabilities required by First Responders and the CF to conduct response.

The Canadian Forces (CF) support the GoC's counter-terrorism efforts in accordance with the *National Defence Act* (NDA), or through Crown Prerogative. The CF will provide direct response to terrorist incidents including CBRNE events under the NDA. Legally, the CF can deploy to support the RCMP domestically in response to a formal request for assistance from the RCMP under section of the NDA which outlines the assistance to law enforcement provisions.⁴⁴ The *Memorandum of Understanding Between the Canadian Forces and the Royal Canadian Mounted Police* details the CF to provide all the basic support arrangements as required for support of the Federal response capability led by the RCMP.⁴⁵ The Minister of Public Safety must determine that a problem exceeds municipal or regional ability or capacity to respond to the emergency. The Minister for Public Safety staffs a request to the Minister of National Defence, requesting CF assistance, and outlining the tasks and nature of the assistance he requires. In theory, the MOU should streamline the process of the CF rendering assistance in the event of a CBRNE event by pre-arranging basic logistical issues.

First Responders at the municipal and regional level are synchronized through the *Chemical Biological Radiological Nuclear and Explosives Resilience Action Plan for Canada*. Considering that the majority of all events will be responded to at least initially by First Responders, the Action Plan is an essential enabler. The Action Plan is designed to address the five strategic objectives identified within the Counter-Terrorism Strategy. The core objectives of CBRNE resilience include leadership for coordinated policy and program development, use of capability-based planning to inform decisions, and building an effective and interoperable workforce. Under the Action Plan, various regional organizations are assigned the national lead

⁴³ Defence Research and Development Canada, "Defence R&D Canada Research Centres", (DRDC website, 29 November, 2012).

⁴⁴ Minister of Justice, *National Defence Act*, (Ottawa: Government of Canada, 28 February, 2013), Section 273(6).

⁴⁵ Canadian Forces. *Memorandum of Understanding Between the Canadian Forces and the Royal Canadian Mounted Police*. (Ottawa: Chief of Defence Staff, 18 March, 2013).

for a variety of programs and are given initial guidance and a timeline for delivery assigned.⁴⁶ The only concern being that the engagement of the regional and federal partners, including those who have been assigned specific responsibilities, is completely voluntary.⁴⁷ Delegation of responsibility for programs to the regional levels ensures that all levels are engaged and that available capacity is utilized in the five year program that began in 2011.

The EMA is the ultimate source of all authority and legally empowers the lead Minister and the supporting departments and agencies to provide and maintain readiness and respond when Canada and Canadians are at risk. From the EMA, the Minister of Public Safety has derived authority to create a counter-terrorism strategy. The CCTS is the capstone document that provides detailed guidance for Canadian counter-terrorism to WoG departments and agencies. The FERP, in conjunction with the supporting plans and formal arrangements forms a patch work of linkages that enables cooperation and provides direction. Together these documents enable WoG readiness and response by allowing the major players to create and maintain CBRNE terrorism response capabilities. They all have a distinct role to play in executing or supporting CBRNE response by creating or supporting the creation of highly specialized capabilities from across a broad spectrum of skills sets into a WoG team. Some of the major players however have interpreted mandates to justify the creation of response capabilities, and others have created capabilities without any existing mandate.

CBRNE Response Capabilities

The major players in Canada's CBRNE community force generate a wide variety of capabilities ranging from First Responders to consequence management. There are two major types of assets defined by their role, readiness, and capability. Response assets are those capabilities that are required for on-site response to perform critical tasks required to defeat or mitigate a threat. These tasks include detection, sampling, forensics, identification, mitigation, decontamination and the rendering safe of devices. Typically response assets are held at a high readiness level of a few hours, they have broad spectrum capabilities and depending on training and equipment are

⁴⁶ Public Safety Canada, *Chemical Biological Radiological Nuclear and Explosives Resilience Action Plan for Canada*, (Ottawa: Government of Canada, January 2011), 3-8.

⁴⁷ Ibid, 1-2.

suited to respond to a CBRNE event. Support assets are capabilities that are required to enable response to a site through the provision of additional capacity or capabilities. They conduct a variety of tasks post release including detection, identification, and decontamination. In general support assets have relatively low level of readiness ranging from days to weeks. Depending on training and equipment these assets are suited to very basic or very complex problems.

Depending on the asset, critical tasks will be completed with different means and achieve different levels of results. The CF have provided direction of the conduct of CBRNE operations that includes some common descriptions of capability suitable for comparing WoG assets.⁴⁸ Detection can be conducted with handheld devices, remotely from robotic platforms or at a standoff distance using specialized equipment. Identification according to the standard set forth by the North Atlantic Treaty Organization standard can be provisional, confirmed or unambiguous depending on the equipment and qualification of the operators.⁴⁹ Mitigation can be achieved by containing, limiting the spread of a threat or rendering the threat inert. Decontamination may be required for people, animals and objects and may include medical care in the contaminated area. Finally, some assets are capable of rendering safe of a device and therefore rendering a threat inert before an agent is dispersed.⁵⁰ In Canada there are several dedicated response assets through out the country and national support assets held at strategic locations.

Response Assets

First Responders are located in all major population centres throughout Canada and are maintained at high readiness. They include law enforcement, firefighters, hazardous materials (HAZMAT) teams and explosive ordinance disposal (EOD) teams. Municipal and regional law enforcement throughout Canada has only limited capabilities and rarely possesses protective equipment and is not suited to CBRNE response. Firefighters are also present in all population centres and can detect and identify a limited range of chemical threats, possess some protective equipment and can provide limited decontamination. There are HAZMAT teams

⁴⁸ Department of National Defence, “Chemical, Biological, Radiological and Nuclear Defence Operations”, (*Defence Administrative Orders and Directives 8006-1*, 25 June, 2009).

⁴⁹ North Atlantic Treaty Organization, *NATO Handbook for Sampling and Identification of Biological, Chemical and Radiological Agents (SIBCRA)*, (NATO Standard: AEP 66, January 2013), 8.

⁵⁰ *Ibid.*

located in the major population centres of Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Alberta and British Columbia.⁵¹ These teams are best suited to initial response for a CBRNE event and are capable of detection, presumptive identification, mitigation and decontamination of a wide range of threat substances. EOD teams are also located in all major centres and can render safe an explosive device or but are not a dispersal device unless they are CBRNE trained.

The National CBRNE Response Team is a RCMP-led federal asset that includes six small regional CBRNE teams throughout Canada and the National Team based out of Ottawa. Regional CBRNE teams are established in Victoria, Vancouver, Edmonton, Winnipeg, Halifax, and St. John's to provide immediate response in advance of the National Team. The Regional Teams are scaled down versions of the National Team that lack CF and PHAC integral components. They are capable of detection, sampling, identification, and the rendering safe of explosive and dispersal devices. The National Team includes elements from the CF and PHAC and has full spectrum CBRNE response capability suited to CBRN response and attribution. The RCMP leads the National Team and provides forensics and rendering safe of devices. The CF component provides detection, sampling, confirmed identification, mitigation, and decontamination. PHAC provides confirmed identification of biological material only.⁵² There is only one National Team and it maintains RCMP and CF components on high readiness while the PHAC is at reduced readiness requiring hours to days to deploy.

CBRN Special Operations Task Forces (SOTF) can be force generated from the Canadian Special Operations Forces Command's CBRNE specialist Unit, the Canadian Joint Incident Response Unit (CJIRU) located in Trenton, Ontario. The Unit has full spectrum CBRNE response capability suited to CBRN response and attribution in support of WoG partners. CJIRU maintains a high readiness component capable of detection, sampling, confirmed identification, mitigation, decontamination and the rendering safe of devices.⁵³ CBRN SOTFs are held at high

⁵¹ Department of National Defence, "Federal and Provincial CBRN Emergency Capabilities", (Trenton: Canadian Joint Incident Response Unit, 16 August 2012).

⁵² Royal Canadian Mounted Police, "Safety and Security for Canadians: Post-Sept 11th - The Fight Against Terrorism", (*Royal Canadian Mounted Police Website*, 11 April, 2013).

⁵³ Chief of Force Development, *Chemical, Biological, Radiological and Nuclear Operating Concept*, (Ottawa: National Defence Headquarters, 3 February, 2012), 7-8.

readiness for domestic response either in support of the RCMP or CANSOFCOM depending on the nature of the response.⁵⁴

Support Assets

Science Town is a proof of concept that was used during Op PODIUM (security for the 2010 Winter Olympics) that grouped mobile laboratories from WoG partners. This large cumbersome capability included four separate laboratories each the size of a 10 Ton truck and staffed by approximately 20 members from the contributing agencies and departments. This delivers the approximate capability of the mobile analytical capability fielded by the CF, with the addition of unambiguous identification for radiological and chemical substances but is four times larger. PHAC contributes a mobile biological laboratory capable of confirmed identification of biological agents, but additional tests are required in a national laboratory in order to achieve unambiguous identification.⁵⁵ The Federal Radiological Assessment Team (FRAT) is a multi-department that contributes a mobile nuclear laboratory capable of unambiguous identification of radiological substances. DRDC Suffield has a mobile chemical laboratory capable of unambiguous identification of chemical substances including explosives and explosive precursors. Environment Canada contributed a smaller mobile analysis capability for confirmed identification of chemical substances. Science Town is not held at a specified level of readiness and takes weeks to aggregate.⁵⁶

The National Microbiological Laboratory (NML) is located at the Canadian Science Centre for Human and Animal Health in Winnipeg. Due to the nature of biological agents, a sample has to be grown in order to provide unambiguous identification and the NML is the first facility in the world to have high containment laboratories for human and animal health in one building. In case of an event, confirmed identification will be done on-site, but a sample will be transported to the NML for further analysis. The NML is recognized as a leader in an elite group of centres

⁵⁴ Department of National Defence, “Integrated Operating Concept”, (*Canadian Special Operations Forces Command Website*, 19 October 2012)

⁵⁵ Gwyn Winfield, “Growing Science Town”, (*CBRNe World*, December 2012), 32-4.

⁵⁶ Royal Canadian Mounted Police, “National CBRN Team Partners and Mobile Labs Capabilities”, (Ottawa: National CBRN Response Team, 25 February 2010).

around the world, equipped with laboratories ranging from bio-safety level 2 to level 4 designed to accommodate the most basic to the most deadly infectious organisms.⁵⁷

The CF maintains integral and close support capabilities in the Army, Navy and Air Force. From the Army, an Immediate Response Unit (IRU) may be called upon in the event of a natural or man-made disaster to assist with response and transition to consequence management.⁵⁸ The IRU is based on a combat unit of roughly 600 soldiers that are capable of detection and decontamination.⁵⁹ The Royal Canadian Navy has an integral force protection CBRN capability aboard its major war ships that is maintained as part of the Navy's readiness cycle as well as Nuclear Emergency Response (NER) Teams on each coast capable of radiological detection and decontamination.⁶⁰ The Royal Canadian Air Force has established Training Flights to provide integral CBRN force protection to each of its Wings. These flights have limited detection and decontamination capability. These elements are made available in the event of a CBRNE event as a force of last resort to assist in protracted response to a large event.

Types of Response

Two types of response may be conducted depending on the degree of warning received and the demands placed on the Response and Support Assets change dramatically. Deliberate deployment is a planned and coordinated pre-positioning of elements to action a pre-determined response plan that has been carefully synchronized well in advance. Much like Op PODIUM, this allows all assets to be deliberately incorporated readily into the force employment concept and removes the demands of maintaining a readiness posture as a limiting factor.⁶¹ No notice deployment is the most likely type of response considering the nature of the potential threats to Canada already discussed. This is also the most difficult type of response as there is no warning. The attack at the Boston Marathon is an example of a No Notice response.⁶² They are triggered

⁵⁷ Public Health Agency of Canada, "National Microbiology Laboratory Overview", (*Public Health Agency of Canada Website*, 2 June, 2012).

⁵⁸ Devlin, Lieutenant-General Peter J. "Statement of Chief of the Land Staff, Department of National Defence". Ottawa: National Defence Committee, 22 November, 2011.

⁵⁹ Chief of Force Development, Chemical, Biological, Radiological and Nuclear Operating Concept, 8-9.

⁶⁰ DND, "Chemical, Biological, Radiological and Nuclear Defence Operations".

⁶¹ Gwyn Winfield, "Quest for Fire in Moosebase Alpha", (*CBRNe World*, October 2012), 22.

⁶² Botelho.

by the discovery of a threat or the execution of an attack and therefore preparedness and readiness of response assets is essential for an effective response.

For a No Notice deployment, the initial response is conducted by the first responder community, including law enforcement, firefighters, EOD, HAZMAT. If there is a release, they will commence detection, presumptive identification, mitigation, and decontamination. If there is no release the On Scene Commander will assess the requirement for additional resources and request regional and national assets. Within hours, the Regional Team will arrive on-site and reinforce or relieve the in place capabilities. Federal teams arrive after the regional teams in most instances and reinforce or relieve the in place capabilities. Due to time delay incurred with their transit from locations in central Canada, it may take as much as 8 hours for the National Team to deploy to location.⁶³ Support Assets on low readiness or on no established response timeline, will aggregate and move to the scene as soon as possible if required. However, considering that a response can be concluded in 12 to 96, hours the reality is the response will be completed before the Support Assets arrive on-site.

Measures of Effectiveness

A Response Asset can only be effective if it is properly prepared and responsive. When comparing capabilities to determine their relative effectiveness, some general metrics can be applied. Core skills are required to cover the capability spectrum individually or in cooperation with partnered municipal, regional or federal assets. These must be synchronized to provide timely response to a full spectrum of threats and nationally there is wide spectrum of capacity available or response to probable events. Unity of effort is essential and if the capability spectrum can be covered with maximum efficiency, then maximum economy of resources can be achieved.⁶⁴ An example is the complimentary nature of the HAZMAT and Regional Teams. They are designed to work in close cooperation with integrated capabilities that avoid duplication of effects and deliver maximum capability in the most efficient manner. Response Assets must be trained to an acceptable common standard. This must be validated regularly to ensure that all Response Assets achieve the desired standard and are validated regularly to ensure

⁶³ DND, “Federal and Provincial CBRN Emergency Capabilities”

⁶⁴ Department of National Defence, “Chemical, Biological, Radiological and Nuclear Defence Development and Sustainment”, (*Defence Administrative Orders and Directives 8006-3*, 25 June, 2009).

that currency is maintained. This presents a problem, as currently there is no established WoG standard for CBRNE responders.

A Support Asset is only effective if it enhances a response. To compare support capabilities to measure their relative effectiveness, different metrics must be applied. The Support Assets must be trained to the same standard as the Response assets that they are replacing or reinforcing. Again, without a common standard, validation and maintenance of currency is not easily achieved. A Support Asset must be designed to effectively operate in the environment into which they will be deployed. Post event, all assets must be prepared to live and operate in an austere environment, be self sufficient and coordinate logistical support as required. They must be suited to a semi-permissive environment where there are potential threats to physical security which must be protected against.⁶⁵ To be added value, a Support Asset must deliver capability or capacity that is not already available on-site. The IRU is an example of added capacity by bringing additional decontamination and detection capabilities on-site should the Response Assets become overwhelmed. Science Town is an example how a desire to deliver capabilities not already on-site, such as unambiguous identification, can grow beyond the requirement and actually cause problems and waste effort. By delivering capabilities that are not required, such as confirmed identification, the response becomes more complex by competing for space, resources and logistical support. Large, costly, and complex it delivers redundant capability on-site in an effort to move scientists and laboratories into close proximity of a potential response site.⁶⁶

Canada does have a wide variety of Response Assets and dedicated Support Assets that together form an effective response to a CBRNE terrorist event. Comparing the types of response, it is apparent that the No Notice deployment presents the greatest challenge due to the need for readiness and responsiveness. Having reviewed GoC direction and what CBRNE capabilities currently exist, there are some readily apparent problems that merit further examination. While Response Assets have been established and are maintained in accordance with the national strategy, they are of varying quality. Support Assets have been created to support domestic

⁶⁵ Ibid.

⁶⁶ Gwyn Winfield, "Growing Science Town", 32-3.

CBNRE response, but their value is questionable. Smaller groups with wider range of capabilities exist in Canada that are easier to command, control, resource and maintain.

Economy of Effort

Quality and added value are sensitive topics when it comes to the subject of CBRNE Response. In Canada, there has been a great deal of effort dedicated to enhancing CBRNE preparedness. However surprisingly, very little has been done to synchronize efforts despite the existence of legal authority and strategic guidance. Although there is no shortage of self-identified CBRNE experts the truth is a lack of focus has wasted a great deal of the efforts to date. Until recently, there was no unifying direction provided by the lead department and so growth was unchecked and resources were consumed without building toward a specific end state. The Resilience Strategy acknowledges that an effective workforce must be developed, resourced, and sustained in order to contribute to CBRNE resilience. The document highlights key tenets like tactical, technical and operational interoperability, but no actual solution is offered by Public Safety. Instead, the document reads more like an affirmation of a problem for which there is no single agency at any level of government that has the required authority and expertise to act unilaterally.⁶⁷ The CRNE Resilience Strategy mentions the establishment of standards as a key objective, but none currently exist.

Quality versus Quantity Assets

The post 9/11 era has been a boon for the CBRNE defence and safety industries that continues today with a global market estimated to be worth as much as \$8.7 billion in 2013.⁶⁸ CBRNE capabilities in particular have become a very large and profitable field, not only for the manufactures of specialist equipment. There is also the business of education that has brought with it challenges to maintaining a quality response capability. Contractors provide training, advice and response planning throughout Canada, but there is no commonly held standard for training a CBRNE responder.⁶⁹ When Canada's current CBRNE response capability is measured for efficiency, an obvious area of concern comes to light. First Responders Response Assets

⁶⁷ Public Safety Canada, *Building Resilience Against Terrorism: Canada's Counter-Terrorism Strategy*, 20.

⁶⁸ Aerospace & Defense News, "Global CBRN Defence Market to Reach \$8.7bn in 2013 According to Latest", (*ASDNews online - Market Research*, 31 January, 2013).

⁶⁹ Gwyn Winfield, "Nailing Jelly to the Wall", (*CBRNe World*, December 2012), 10-1.

have been established, and training is conducted regularly but there has been no consistent standard applied to what they have trained to do, and to what standard they are capable of performing assigned tasks. While the CCTS and the FERP assigns responsibilities and tasks, there is no mention of standards or how assets are certified for currency.

Public Safety has not directed the governance of training or provided criteria for contracted training to meet in order to maintain a standard. Law enforcement adheres to a strict standard required for them to be identified as peace officers as set out by the *Criminal Code of Canada*.⁷⁰ Firefighters and HAZMAT follow established standards of the National Fire Protection Agency (NFPA). NFPA creates, publishes, and disseminates more than 300 consensus codes developed as a standard of practice from accepted best practices from the professional community in North America. Codified, these standards for the competency and currency cannot be ignored or diluted. Through the continued evolution, they ensure that best practices from the First Responder community are incorporated and consensus is achieved at through a formal approval practice.⁷¹ This is not the case for CBRNE training where there is no accepted WoG or international standard to measure against.⁷² As a result, the quality of CBRNE response varies from city to city. Although Public Safety has articulated a desired to address this shortcoming, recently Canada has seen the demise of the First Responder Training Program (FRTP). As a cost saving measure, CBRNE qualifications have also been removed from the Canadian Police College curriculum, leaving the Canadian Management College as the last option for CBRNE training.⁷³ Even the FRTP implementation was problematic, as instruction was provided in an ad hoc manner from a variety of sources ranging from private contractors with limited training or experience to national recognized establishments.⁷⁴

Efficient Capability Growth

⁷⁰ Minister of Justice, *Emergency Management Act*, (Ottawa: Government of Canada, 3 August, 2007).

⁷¹ National Fire Protection Association, *NFPA 472: Standard for Competence of Responders to Hazardous Materials*, (2013 Edition).

⁷² Gwyn Winfield, "Nailing Jelly to the Wall", 8-9.

⁷³ Public Safety Canada. "Canadian Emergency Management College History". *Public Safety Canada Website*, 11 April, 2013.

⁷⁴ Alison Kerry, 2007-2008 Integrated Summative Evaluation of the Chemical, Biological, Radiological and Nuclear First Responder Training Program, (Ottawa: Canadian Emergency Management College, Public Safety Canada, 29 October, 2007), 29-36.

A model has to be established for reliable and efficient production of effective Response Assets through collective training and readiness training. One example already exists that is well established due to the rigor put behind the development of the National and Regional Teams. Operators from RCMP and CF follow a common training regime that has been established in accordance with established tactics, techniques and procedures. Individual training is complimented with collective training, allowing operators to be trained individually and as part of a team. The National Teams, Regional Teams, and SOTFs follow courseware that has been developed in cooperation with WoG partners but is only delivered to these select federal assets. Standards are maintained within the core organizations such as the RCMP Explosive Disposal and Technology Section to ensure consistent levels of skill and proficiency of for Forensics and EOD operators. Similarly, the CF centres of excellence at the Canadian Force Fire and CBRN Academy and CJIRU provide the same functions for CBRNE operators.⁷⁵ If contractors are used to provide additional training capacity, they must adhere to accepted national or international standards that are occupational requirements defined by the RCMP and CF for individual operator skill sets.

Even though a model exists, the difficulty is creating the conditions for the CBRNE community to adopt a similar mechanism. First an integrated operating concept has to be established by a credible department or agency well versed in operational planning that is designed to enable the integration of WoG assets. This means a national standard based on existing precedent such as the CBRN Operator military occupation specialty created by the CF.⁷⁶ Since the occupation was created in 2010, training and readiness governance of a professional CBRNE responder class has been created. Technical, tactical and academic training is delivered from accredited sources and institutions to deliver a consistent quality of operator in a repeatable manner. Much like law enforcement, this enables the creation of effective CBRN operators against an existing model and creates a source from which best practices can be harvested, refined and integrated. A similar approach is required to govern regional and national programs to ensure curriculum from disparate programs are harmonized. Without this baseline established, CBRNE responders will have to continue to rely on ad hoc arrangements and limited exposure on collective training

⁷⁵ Department of National Defence, “Chemical, Biological, Radiological and Nuclear Defence Training”, (*Defence Administrative Orders and Directives 8006-2*, 25 June, 2009).

⁷⁶ Department of National Defence, “CBRN Operator Becomes Trade”, (*The Maple Leaf*, Volume 13, Number 3, 27 January, 2010).

events to ensure interoperability.⁷⁷ Readiness could be tested in a consistent manner to ensure that individual and teams are certified as capable and current.

Focusing Support

Support Assets have become very fashionable thanks to the major deliberate deployment for Op PODIUM. A trend has emerged where the force projection of Support Assets that are either unnecessary, waste capacity, or dislocates key assets is created and deployed to gain exposure. Although agencies and departments are performing essential functions and may be achieving outstanding results, visibility is essential to ensure survival in a stark fiscal climate. Control of Support Assets is in itself a paradox, where the national leadership looks to the individual departments and agencies to decide what they are able or willing to contribute instead of directing what is required.⁷⁸ As a result, agencies and departments have grown Support Assets, without being requested or directed to do so, that often duplicate effort and drains resources. The problem is the department and agencies, and ultimately the Public Safety leadership, have sacrificed practical effects to create political effects. In spite of a readily available model that can be grown to create professional and proficient CBRNE operators, it is both easier and more popular to have scientist to conduct CBRNE response. The prime example of unfocused support is the creation of Science Town and the secondary and tertiary effects it has created.

As discussed previously, Science Town does include an impressive array of capabilities and at first glance, may be assessed as a valuable Support Asset, but actually has limited value on-site. The workforce of Science Town has impressive credentials and typically includes highly qualified scientists and technicians that normally would be used as reach back to assist on-site responders. They possess highly technical analytical equipment and, with the exception of the PHAC component, are capable of unambiguous identification of CBRNE materials. By deploying this capability for a deliberate event such as Op PODIUM, the scientific community are able to gain exposure to increase their visibility and status within the WoG.⁷⁹ The problem associated with deploying Science Town is that it comes at a very high cost, beyond the high financial cost of nearly \$20 million. There is also the cost of removing the leading science and

⁷⁷ Winfield, "Quest for Fire in Moosebase Alpha", 25-6.

⁷⁸ Public Safety Canada, *Federal Emergency Response Plan*, Section 4.

⁷⁹ Winfield, "Quest for Fire in Moosebase Alpha", 22.

technology support staff from their permanent facilities, they become dislocated from their networks and resources, becoming effectively isolated from the scientific community. The training and validation of Science Town presents a drain on the finite training resources available, competing with higher priority groups for access to critical enablers such as live agent training.⁸⁰ It takes effort from the on-site assets to support Science Town, as it does not have integral logistical support and is dependant on others for resources. Due to the increase in personnel and equipment, should a threat manifest on-site, they present a valuable and vulnerable target.

Although some unique capabilities are delivered, the residents of Science Town have not rationalized requirements, synchronized tasks or even agreed to responsibilities.⁸¹ Roughly 50% of the equipment on-site is designed for use by First Responders or HAZMAT technicians to perform confirmed identification.⁸² This capability was already held by Response Assets in sufficient quantity for the event, and therefore approximately \$950 thousand of redundant equipment and mobile platforms was procured.⁸³ Furthermore, the staff could also have been reduced by approximately 50% or 10, scientists if Science Town cover gaps and harmonized effects with the Response Assets. The training and on-site execution required for Op PODIUM amounted to approximately three months for the staff of Science Town. Factoring 10 scientists dislocated for Science Town a total of 30 months of productivity was lost to deliver a redundant capability. Instead of complimenting capabilities or adding capacity on-site by addressing gaps, Science Town performs the same functions at the same time as the Response Assets. What is needed is effective and participative leadership to shape WoG contribution to create some efficiency.

Leadership Challenges

The Action Plan does provide some guidance but is designed to address agencies and department and not detail operational outputs. The Action Plan was intended to provide amplification of the

⁸⁰ Gwyn Winfield, "A Nice Problem to Have...", (*CBRNe World*, December 2012), 40.

⁸¹ Winfield, "Growing Science Town", 33-4.

⁸² RCMP, "National CBRN Team Partners and Mobile Labs Capabilities".

⁸³ Ibid.

parent documents and assigned individual areas of responsibility.⁸⁴ However, this does not address the root issue. Unfortunately, lack of clearly defined roles in the decade since 9/11 has resulted in lethargic and inefficient processes. Decisions are made by committees formed by members that are seldom empowered to make decisions and rarely achieve results beyond agreeing that something has to be done and possibly when the next meeting will take place. In this climate, it is impossible to achieve timely results as decision makers are not present or effectively represented. This reality is hard to change as WoG agencies and departments for the most part actually thrive in this type of environment. With no clear leadership, there is no oversight and governance to ensure WoG assets are focused on assigned takes and do not lose focus following their drifting mandates. What is required is a clear mandate to the CBRNE response leaders to direct what effects are desired on-site and shape the fit, form, and function of the Support Assets intended to address capability gaps and deliver required capacity. Assertive leadership would fill the existing power vacuum, but unfortunately it does not exist at present.

The Action Plan does not effectively assert Public Safety leadership for a variety of reasons. By delegating the responsibility of leading national capability to regional EMOs, Public Safety has encouraged further delays and compromised the intent of the Action Plan. Now regional EMOs have to engage federal departments and agencies to provide direction on behalf of the lead federal agency.⁸⁵ A broad scoped approach is outlined in the plan, but there is no clear prioritization of efforts or limits to prevent drifting mandates. The Action Plan is completely reliant on consensus building, which is made far more complex than usual by bringing the regional EMOs into the decision process. Clearing defined priorities and deliverables must be established by focused groups to achieve collective results. Building consensus is important to maintain harmony within WoG, but must be tempered by empowering groups with authority. Strong and focused leadership is critical to the efficient build of effective CBRNE capability and cannot be delegated.⁸⁶ Capability must be managed in a holistic manner by applying governance at the federal level and assigning specific capability leads and supporters to each capability under the direction of Public Safety.

⁸⁴ Public Safety Canada, *Chemical Biological Radiological Nuclear and Explosives Resilience Action Plan for Canada*, 3-7.

⁸⁵ Public Safety Canada, *Chemical Biological Radiological Nuclear and Explosives Resilience Action Plan for Canada*, 1-2.

⁸⁶ *Ibid*, 3-8.

Canada does have effective CBRNE capability as demonstrated by the ability to respond to No Notice and Deliberate events, but this is achieved at the expense of creating a sustainable model. There are efficient means available to produce proficient capabilities, but this has not been directed by Public Safety or adapted by the CBRNE community. Since Canada lacks a mechanism for creating quality capabilities beyond the CF, a more is more approach has allowed a blossoming CBRNE industry to gorge itself on government spending to provide quantity without a standard of quality. The community is also challenged by inefficient use of critical assets including science and technical support. Although their mandates are expressed in government direction in broad terms, agencies and departments have allowed their mandates to drift. Moreover, the lack of focus in Canada's CBRNE community can be attributed to the simple matter of leadership. Without effective and clear leadership, institutional inertia has prevented efforts to provide direction from having the desired effect. All the essential elements for an efficient model exists, all that is required to create efficiency in Canada's CBRNE community is synchronization of efforts across the WoG.

Operationalizing Science

Economy of effort is often an elusive goal in WoG structures. There is much work left to be done to create an efficient CBRNE response capability, but the current Minister of Public Safety has made significant improvements. At the strategic level, the importance of Public Safety's leadership role cannot be overstated. Neither can the challenges faced at all levels of government to maintain and effect capability as Canada moves into a period of fiscal constraint. The scientific community in particular has been dramatically affected by budget cuts that have greatly reduced staff in key element such as defence science in the DRDCs. Expenditures for equipment and capability must be carefully managed across the WoG to create the efficiencies necessary to weather the fiscal storm. Public Safety and DND are the two major spenders who fund the procurement of CBRNE equipment and capability in Canada. Public Safety is the major funding envelope for First Responders, RCMP, PHAC, and HC.⁸⁷ DND funds all CBRN capability in the CF including the Response Assets assigned to support the National Team under

⁸⁷ Defence Research and Development Canada, "Canadian Safety and Security Program", (*DRDC Website*, 29 November, 2012).

the CF MOU with the RCMP.⁸⁸ Their recent efforts illustrate what to do and what not to do when seeking to manage resources in order to field an efficient CBRNE response capability.

Inefficiencies in Project Management

CBRNE in DND has evolved significantly in the post-911 era, but while significant resources were allocated to CBRNE, DND and the CF have had some issues with project management of capabilities over the past few years. The 2008 audit of the CBRN Defence Omnibus Project demonstrated the inefficiency of DND's contracting and expenditure process by focusing on 13 CBRNE sub-projects valued at \$20 million annually. Poor access to procurement staff and the lack of input from DND end users compounded the challenges of inexperienced project managers. On average, it took 53 months for a project from definition to contract award, but due to problems encountered with CBRN capability management in some cases, it took up to 84 months.⁸⁹ The report identified an increase of project management cost of \$5.2M for four of the Omnibus sub-projects due to an average 31 months of delays. Each of the 13 CBRN sub-projects was managed separately resulting in duplication of effort and congestion in the approval chain. Moreover, the project staff lack requisite CBRN knowledge and therefore did not understand the capability they were working to deliver or how to leverage operator or scientific community input in an effective or efficient manner.⁹⁰ Although the report was ironically incomplete due to delays and lack of scope, the recommendations highlighted the need for centralized governance for CBRN capability projects within DND.

In June 2009, the DND and CF began to address the inefficiency and acknowledged the requirement for a focused approach to CBRNE capability. As a result the CF developed Defence Administrative Orders and Directive 8006 under the authority of the Vice Chief of Defence Staff to outline policy operations, training, capability and development.⁹¹ In addition the *Chemical, Biological, Radiological and Nuclear Operating Concept* was promulgated in February 2012 to

⁸⁸ Canadian Forces. *Memorandum of Understanding Between the Canadian Forces and the Royal Canadian Mounted Police*.

⁸⁹ Chief Review Services, *Audit of the Chemical, Biological, Radiological and Nuclear (CBRN) Defence Omnibus Project*, (Ottawa: Department of National Defence, May 2008), 9-10.

⁹⁰ *Ibid*, 12-3.

⁹¹ Department of National Defence, "Chemical, Biological, Radiological and Nuclear Defence", (*Defence Administrative Orders and Directives 8006-2*, 25 June, 2009).

provide the framework required for force developers, generators and employers for domestic and expeditionary operations.⁹² The need for effective coordination and quality advice was also acknowledged and the requirement for “staff with a full understanding of all technical aspects of employment and development of the CBRN defence capability” was clearly articulated.⁹³ More importantly, with the creation of the CBRN Operator occupation in 2010 and a decade of operational experience accrued with the Canadian Joint Incident Response Unit, staff who actually understand the technical aspects of CBRN actually exist. As DND works toward a more efficient model, it would be wise to study Public Safety’s dramatic restructure of its funding model and organization of Science and Technology (S&T) support to domestic security.

Canadian Safety and Security Program (CSSP)

For Public Safety, funding is the major issue limiting or enabling CBRNE response and has often been a friction point between WoG partners. The vehicle for the allocation of federal funding for initiatives to enhance Canadian security is the Canadian Safety and Security Program (CSSP). The CSSP a federally-funded program that is allocated \$43.5 million dollars annually “to strengthen Canada’s ability to anticipate, prevent/mitigate, prepare for, respond to, and recover from natural disasters, serious accidents, crime and terrorism” by meshing science and technology (S&T) with government policy, operational outputs and intelligence.⁹⁴ Today’s program is a result of GoC efforts to create a more efficient system by amalgamating programs that were linked or in some ways duplicating efforts. Prior to Jun 2012, there were three programs responsible for the allocation of government funding for S&T support to security related programs:

The Chemical, Biological, Radiological-Nuclear and Explosives (CBRNE) Research and Technology Initiative (CRTI), focused on CBRNE counter-terrorism.⁹⁵ The CRTI funded a variety of initiatives leading to the acquisition of capability for First Responders and regional or federal CBRNE response;

⁹² Chief of Force Development, *Chemical, Biological, Radiological and Nuclear Operating Concept*, 7-8.

⁹³ Chief Review Services, *Audit of the Chemical, Biological, Radiological and Nuclear (CBRN) Defence Omnibus Project*, 15.

⁹⁴ Defence Research and Development Canada, “Canadian Safety and Security Program”

⁹⁵ Ibid.

The Public Security Technical Program (PSTP), focused on critical infrastructure protection, cyber, surveillance, intelligence, interdiction, border security, emergency management systems and interoperability.⁹⁶ The PSTP funded initiatives at the federal, regional and municipal levels focusing on federal agencies and provincial emergency management organizations; and

The Canadian Police Research Centre (CPRC), focused on response capabilities required for critical incident response and consequence management.⁹⁷ The CPRC funded initiatives for the benefit of police, fire and emergency medical services across Canada.

Streamlining Processes

With the creation of CSSP, Public Safety has been able to achieve two effects. First, the amalgamation of the three legacy programs created some reductions in staff and processes that eliminated a portion of the bureaucracy. By reducing the number of programs, the cost of operating the program was streamlined. Second, the synchronization of initiatives is now ensures that duplication of effort is minimized. While the former system allowed stovepipes for the management of funding within a niche requirement of a specific agency or department, now all initiatives were collected in a single clearing house for prioritization. The CSSP is managed by the DRDC Centre for Security Science (DRDC CSS). Providing leadership on behalf of the GoC, DRDC CSS is charged with the responsibility of harmonizing S&T efforts with operational requirements. To accomplish this aim, DRDC CSS is partnered with all levels of government, the responder community, emergency management organizations, non-governmental agencies, industry and academia. CSSP investments are prioritized according to Canadian safety and security requirements and gaps identified through detailed assessments. On March 12, 2013 DRDC CSS announced 26 new programs to be funded by the newly created CSSP. Amounting to approximately \$20M in investments, the projects, at least on the surface, appear to address the program's mandate.

The breakdown of the projects lends some insight into the government's prioritization of CBRNE defence. Fourteen of the new projects are related to CBRNE response ranging from

⁹⁶ Ibid.

⁹⁷ Ibid.

preparedness to response and consequence management capabilities. An additional seven of the projects are related to command and control function that enable information sharing, situational awareness, and share common operating picture that enable CBRNE operations. The scope of these projects is also impressive with eleven provinces and territories partnered with sixteen federal departments and agencies. In line with its mandate, more than a dozen private companies, three EMOs, four universities and four NGOs are also represented in these CBRNE projects. While previously three separate programs would compete for resource allocation and consuming a significant portion of the annual budget on the management of the programs, now CSSP appears to be meeting the mail. The 26 proposals do not have similar or duplicate projects, all stakeholders are represented and funding distributed across the entire spectrum.⁹⁸ In isolation, CSSP seems to be the solution providing the required efficiency without sacrificing results, by synchronizing programming for the \$20M allocated budget.

Cost for Effects

The scientific community has taken a very literal interpretation of operational support that has become a distraction. As seen with Science Town, it has become fashionable to deploy on-site even if only to provided redundant capabilities.⁹⁹ In this manner, although scientists can perform some of the same tasks that operators perform, the question is: where does a scientist have best effect? Having scientific support is essential to building an effective capability but if operators are doing operations and the scientists join them, scientists are unable to perform their primary functions such as research. Interestingly, the restructure and workforce rationalization has made it clear that there are finite resources available to the scientific community, so any efforts to conduct activities outside of core skills should be avoided. There has been no effort to rationalize the need for on-site scientific support with the CBRNE community to respond to the needs and priorities of Response Assets. If the desired effect is for the scientific community to maintain governance in accordance with the Action Plan, this does not mean finite resources

⁹⁸ Department of National Defence, “Government of Canada invests in Canada’s Safety and Security”, (*National Defence and the CF Website*, 12 March, 2013).

⁹⁹ Winfield, “Growing Science Town”, 32-4.

should be allocated to performing response functions.¹⁰⁰ A much better use of their expertise would be leveraging scientists to support capability life cycling.

The GoC describes the tasks and in turn, the operators determine what effects are to be delivered. Scientific support should be focused squarely on partnering with operators to ensure that the best possible capability is delivered. Capabilities should be based on desired operational outputs, in partnership with scientists who advise on what capabilities should be created. This includes advice on what to procure and how new capabilities can be integrated existing force employment concept. This requires training to be conducted by institutions or groups that should be developed in cooperation with scientists who help establish standards and ensure operators are certified to perform complex tasks. Once deployed, operators will then field a capability selected, shaped, and integrated into a response in partnership with science. In this manner, a single scientist can enable teams of operators to perform a variety of tasks to a level confirmed by the scientists without needing the scientist on-site. Operators can reach back to their partners should problems are encountered on-site to the scientists, who is now available to continue work without being interrupted to train, prepare and execute the tasks being completed by the operators.

There is a great deal of work left to be done by Public Safety, but the desired end state is clear. In order to maintain an effective CBRNE response capability, efficiency is not only desirable, but essential. As budgets shrink, agencies and departments must focus on their core mandates and streamline processes if they are to remain effective. This means efficiency is essential to all aspects of CBRNE response capability management from funding to programmatic. There is much work to be done, particularly by DND and CF, to ensure timely and efficient delivery of capability. Public Safety's initiative to restructure its programs and funding model is clearly a step in the right direction that has already produced stability and generated efficiencies. All that remains is for the rest of the CBRNE community to follow in the same footsteps. This includes aligning support from the scientific community to effectively enable response instead of conducting response by operationalizing science. This will prove a significant challenge, as the scientific community finds itself at a crossroads, force to choose between creating political or

¹⁰⁰ Public Safety Canada, *Chemical Biological Radiological Nuclear and Explosives Resilience Action Plan for Canada*, 1-2.

practical effects. The scientific community needs clear direction and guidance if it is to effectively support response by working in cooperation and not competition with operators.

Conclusion

Recent events in North America may generate some renewed interest in the subject, but ignorance of the threat posed by CBRNE terrorism remains. Canada and Canadians face a very real threat from terrorism at home and abroad even in the most secure areas. The proliferation of the knowledge and means to create and deliver threats continues to shock us with the physical and psychological damage they create. As demonstrated, the knowledge is readily available in Canada to create a CBRNE weapon for individuals and groups with the requisite skills. Skilled individuals for a variety of reasons possess and continue to proliferate this knowledge. In spite of the efforts of government agencies and departments, materials are readily available in Canada. Either naturally occurring, easily accessible or transported in vast quantity through or near Canadian cities, threat agents or CBRNE materials are easily accessible in Canada. Either intentionally as witnessed in Boston or unintentionally as witnessed in Waco, these threats have manifested without warning to claim lives and threaten security. A decade after 9/11, the global business of CBRNE has blossomed and continued to thrive due to the instability generated by terrorism. Canada has also responded to these threats, but this has not been without growing pains. Currently the Canadian CBRNE response capability is vastly inefficient and redundancies need to be addressed to ensure it can be maintained within available means.

The GoC has given direction to ensure Canada and Canadians are safe and secure, and this direction has enabled the maintenance of an effective, large and robust CBRNE response capability. Although this has brought together assets from municipal, provincial, and federal levels in a WoG effort, these agencies and departments have drifted away from their core mandates. Canadian law, the government's strategy, and existing plans clearly outline roles and responsibilities that have been redefined to create opportunities for political gain. Furthermore, the lack of an established standard for CBRNE responders has created the false impression that scientists must conduct operations in order to establish credibility and deliver skills that do not exist at an acceptable level. The reality is that models to address both the need to codify standards and create professional and proficient CBRNE responders exist. Other than the CF

and RCMP, the WoG is disinterested in building a sustainable model. Public Safety's delivery of a detailed Action Plan to enact the Resilience Strategy has created the conditions for future success, but implementation will take time to create a truly efficient model.

Management of those resources has actually presented a potential for addressing systemic inefficiency of the WoG, by focusing the finite resources in a deliberate manner. Public Safety has already made some significant changes to the resource model that will pay dividends in 2013. DRDC CSS has already made significant progress in improving what is resourced, enabling effective prioritization to maximize the effects created from a shrinking resource pool. Under the leadership of Public Safety, the restructure of the CRTI into the CSSP has eliminated duplication of effort and ensured equitable allocation of resources to support current and future capabilities. For the WoG, this is an example to emulate, particularly in DND and the CF, where a decade of plenty has allowed inefficient processes to waste millions of dollars annually due to poor execution of projects directly related to CBRNE response capability. Much like the WoG should look to DND and the CF for an efficient capability model, DND should look to Public Safety and DRDC CSS to adopt a model of efficient project management. Unfortunately, resource management is streamlined across the WoG, opportunity will still exist for department and agencies to follow individual agendas. Approaching fiscal realities has created opportunities for agencies to create political effects to secure funding and resources by generating highly visible, inefficient capabilities like Science Town.

Science Town is the most obvious example of inefficiency with Canada's domestic CBRNE response capability. The scientific community's continually evolving role in Canada's WoG domestic CBRNE response capability continues to create challenges to an efficient model. Although the priority of supporting the CF has been reinforced within the DRDCs, misguided and asynchronous efforts have generated impressive capabilities that create additional demands of finite resources such as specialized training. Instead of supporting the build of CBRNE operators, scientists have usurped the role of responder and dislocated attempts to build a streamlined response model. CBRNE response leaders need to be empowered to direct what effects are desired on-site and shape the fit, form, and function of the Support Assets intended to address capability gaps and deliver required capacity. Scientific support needs to be focused on

partnering with CBRNE responders to ensure that the best possible capability is delivered. In partnership, scientists need to advise on what capabilities should be created and how new capabilities can be integrated into the existing force employment concept. This requires training to be conducted by institutions or groups, developed in cooperation with the scientific community, helping to establish standards and ensure operators are certified to perform complex tasks. None of this is possible however, without clear direction and guidance if it is to effectively support response by working in cooperation and not competition with operators.

Bibliography

Aerospace & Defense News. "Global CBRN Defence Market to Reach \$8.7bn in 2013 According to Latest". *ASDNews online - Market Research*, 31 January, 2013.

Allison, Graham. *Nuclear Terrorism: The Ultimate Preventable Catastrophe*. New York: Henry Holt and Company, 2005.

Bosch, Torie. "Missing Vial of Dangerous Virus Highlights Security Problems at U.S. Labs". *Slate*, 25 March, 2013.

Botelho, Greg. "Mourning, resolve and quest for answers after deadly Boston Marathon bombs". *CNN Website*, 17 April, 2013.

Canadian Forces. *Memorandum of Understanding Between the Canadian Forces and the Royal Canadian Mounted Police*. Ottawa: Chief of Defence Staff, 18 March, 2013.

Canadian Nuclear Safety Commission. *Report on Lost or Stolen Sealed Sources and Radiation Devices*. Ottawa: Government of Canada, 10 December, 2012.

Canadian Security Intelligence Service. *Public Report 2010-2011*. Ottawa: Public Works and Government Services Canada, 2012.

Chief of Force Development. *Chemical, Biological, Radiological and Nuclear Operating Concept*. Ottawa: National Defence Headquarters, 3 February, 2012.

Chief Review Services. *Audit of the Chemical, Biological, Radiological and Nuclear (CBRN) Defence Omnibus Project*. Ottawa: Department of National Defence, May 2008.

Chorley, Matt. "Dirty bomb attack now a 'real threat' to Britain as nuclear waste smugglers swap tips online Foreign Office warns". *Mailonline*, 1 November, 2012.

Defence Research and Development Canada. "Defence R&D Canada Research Centres". *DRDC Website*, 29 November, 2012.

..... "Canadian Safety and Security Program". *DRDC Website*, 29 November, 2012.

Department of National Defence. "CBRN Operator Becomes Trade". *The Maple Leaf*, Volume 13, Number 3, 27 January, 2010.

..... "Chemical, Biological, Radiological and Nuclear Defence". *Defence Administrative Orders and Directives 8006*, 25 June, 2009.

..... "Chemical, Biological, Radiological and Nuclear Defence Operations". *Defence Administrative Orders and Directives 8006-1*, 25 June, 2009.

..... “Chemical, Biological, Radiological and Nuclear Defence Training”. *Defence Administrative Orders and Directives 8006-2*, 25 June, 2009.

..... “Chemical, Biological, Radiological and Nuclear Defence Development and Sustainment”. *Defence Administrative Orders and Directives 8006-3*, 25 June, 2009.

..... “Federal and Provincial CBRN Emergency Capabilities”. Trenton: Canadian Joint Incident Response Unit, 16 August 2012.

..... “Integrated Operating Concept”. *Canadian Special Operations Forces Command Website*, 19 October 2012.

..... “Government of Canada invests in Canada’s Safety and Security”. *National Defence and the CF Website*, 12 March, 2013.

Devlin, Lieutenant-General Peter J. “Statement of Chief of the Land Staff, Department of National Defence”. Ottawa: National Defence Committee, 22 November, 2011.

Helmenstine, Anne Marie. “The Myth About Learning How to Make Ricin from the Internet”, *About.com Chemistry*, 29 February, 2008.

Holpuch, Amanda, Peter Walker and Warren Murray. “Texas explosion: up to 15 dead after fertiliser plant blast”. *The Guardian*, 18 April, 2013.

Kerry, Alison. 2007-2008 Integrated Summative *Evaluation of the Chemical, Biological, Radiological and Nuclear First Responder Training Program*. Ottawa: Canadian Emergency Management College, Public Safety Canada, 29 October, 2007.

Littlewood, Jez, Nathalie Kauffeldt and Adam Kanyz. “Perceptions and Realities of Terrorist Threats: Government, Institutional, and Social Responses”. *The Bridge*, 23 August, 2010.

Minister of Justice. *Criminal Code of Canada*. Ottawa: Government of Canada, 27 March, 2013.

..... *Emergency Management Act*. Ottawa: Government of Canada, 3 August, 2007.

..... *National Defence Act*. Ottawa: Government of Canada, 28 February, 2013.

National Fire Protection Association. *NFPA 472: Standard for Competence of Responders to Hazardous Materials*. 2013 Edition.

North Atlantic Treaty Organization. NATO Handbook for Sampling and Identification of Biological, Chemical and Radiological Agents (SIBCRA). NATO Standard: AEP 66, January 2013.

MacAskill, Ewen. "Ricin' letters: Man arrested in connection with packages sent to Obama and Wicker". *The Guardian*, 18 April, 2013.

Miller, Judith, Stephen Engelberg and William Broad. *Germs: Biological Weapons and America's Secret War*. New York: Touchstone, 2002.

Minister of Public Safety. "Launch of Building Resilience Against Terrorism: Canada's Counter-Terrorism Strategy". Ottawa: Speech, 9 February, 2012.

Public Health Agency of Canada. "Mandate". *Public Health Agency of Canada Website*, 16 June, 2012.

..... "National Microbiology Laboratory Overview". *Public Health Agency of Canada Website*, 2 June, 2012.

Public Safety Canada. *Building Resilience Against Terrorism: Canada's Counter-Terrorism Strategy*. Ottawa: Government of Canada, 9 February, 2012.

..... "Canadian Emergency Management College History". *Public Safety Canada Website*, 11 April, 2013.

..... *Chemical Biological Radiological Nuclear and Explosives Resilience Action Plan for Canada*. Ottawa: Government of Canada, January 2011.

..... "Emergency Management Act Backgrounder". *Public Safety website*, 8 February, 2012.

..... *Federal Emergency Response Plan*. Ottawa: Government of Canada, January 2012.

Royal Canadian Mounted Police. "Safety and Security for Canadians: Post-Sept 11th - The Fight Against Terrorism". *Royal Canadian Mounted Police Website*, 11 April, 2013.

..... "National CBRN Team Partners and Mobile Labs Capabilities". Ottawa: National CBRN Response Team, 25 February 2010.

Smith, Chip. "Coffee or Something Stronger: An Interview with Uncle Fester". *The Hoover Hog*, 29 July, 2013.

Solomon, Linda. "Hazardous chlorine leak in North Vancouver". *Vancouver Observer*, 2 March, 2011.

Uncle Fester. *Silent Death (Revised and Expanded second Edition)*. Green Bay: Festering Publications, 1997.

Walkom, Thomas. "Canadian troops drawn into Mali's war, despite what Prime Minister Stephen Harper says". *The Star*, 29 January, 2013.

Winfield, Gwyn. "A Nice Problem to Have...". *CBRNe World*, December 2012.

..... "Growing Science Town". *CBRNe World*, December 2012.

..... "Nailing Jelly to the Wall". *CBRNe World*, December 2012.

..... "Quest for Fire in Moosebase Alpha". *CBRNe World*, October 2012.

Yellin, Jessica. "Israeli Minister: It's clear that chemical weapons were used in Syria". *CNN Website*, 20 March, 2013.