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THE NEED TO MOVE FROM LINEAR TO NON-LINEAR PROBLEM SOLVING: A COUNTER PROLIFERATION FRAMEWORK

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DIRECTED RESEARCH PAPER

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A COUNTER PROLIFERATION FRAMEWORK**

By Major Paolo Pavese

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EXECUTIVE SUMMARY

The acquisition of chemical, biological, radiological, nuclear and explosive weapons remains an attractive option to terrorist organisation looking to further their goals as these weapons have a dual effect of causing not only physical damage, but damage on the psychological plain as well. This makes them an ideal instrument of terror. As the desire to obtain these weapons remains, new ways to circumvent barriers are being found by non-state actors looking to proliferate these technologies. These methods cross the jurisdiction of multiple government departments and State boundaries further complicating the issue. Counter proliferation activities are therefore joint, interagency, military and public in nature, so problem solvers must be able to factor in numerous influences well beyond the scope of most conventional military problems. Understanding these factors helps to shape the military options in counter proliferation activities, where the relationship between action and effect is not linear in nature.

The non-linear nature of the problem and the impact this has on planning counter proliferation activities is thus the focus of this paper. A complete review of all the organisations involved in counter proliferation domestically has not been attempted due to the scope and complexity of the issue, however enough fidelity has been placed into the model to demonstrate the wicked nature of the problem. Due to the wicked nature of the problem space, it becomes clear that linear problem solving methods such as the Operational Planning Process are insufficient at addressing the issues inherent in counter proliferation. In order to achieve a

phronetic model capable of standing changes to the proliferation situation, the social sciences were investigated and the concepts within design theory explored.

It is within the concepts and consideration of design theory that a solution to the issue of counter proliferation planning can be found. The flexible nature of the problem solving methods emphasise analysis and understanding over process. This true in depth analysis of the solution space creates deeper understanding of the various interactions within the issues of counter proliferation. This leads to an understanding of the system beyond the “rules” with a focus on the “game.” Through the integration of narrative and story, the understanding is further enhanced as a mental tool linked to a familiar situation creates understanding of the interactions in the system.

The result is that in order for the Canadian Armed Forces to honestly address counter proliferation issues, acting in a supporting role to other government departments, then a shift in the planning paradigm must take place. This analysis demonstrates that the counter proliferation problem space in Canada is wicked in nature and that design theory and the linked application of systemic operational design should be considered.

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I would like to acknowledge my academic advisor Dr P.T. Mitchell for his efforts in directing me down the path of design theory and taking the time to converse with me on this subject. I am now a lifelong convert to this problem solving method.

I would like to thank my colleagues within the Special Operations Forces and the Chemical, Biological, Radiological, Nuclear and Explosive communities for the discussions we have had on this subject both now and in the past. Familiarity with the subject and understanding has allowed me to analyse this issue from a new viewpoint. I hope that the work conducted here can be used to aid in developing counter proliferation strategy to aid in the defence of Canada.

Finally I would like to thank my family, friends and classmates who have endured my constant rants against linear problem solving methods and the importance of context. Unfortunately for all, despite completing this paper, I believe I will not let these issues go.

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In the tactical sub-system analytical thinking is an adequate response to solving complicated, short-term problems. However, in the strategic sub-system formal linear planning, with its over-reliance on forecasting and estimates, and the search for clear cause and effect relationships, is less than useful. Systems thinking, looking at issues holistically and focusing on relationships and feedback loops, is essential to solving so-called “wicked” problems.

-Lieutenant Colonel (Retired) Bill Bentley, PhD¹

¹ Bill Bentley, *Military Strategy: A Primer*, CANSOFCOM Professional Development Centre (Kingston: CDA Press, 2011), 48.

CHAPTER 1: WHAT IS COUNTER PROLIFERATION

Introduction

When Dr Bruce Ivins mailed Anthrax laced letters to various government personnel across the United States (US) in 2001, he made biological warfare a household concern within the United States.² As a scientist, Dr Ivins had direct access to the materials he required and demonstrated how an individual could use Weapons of Mass Destruction (WMD)³ or Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE)⁴ agents to further an agenda.⁵ The result of this attack dubbed “Amerithrax” was the death of five people with an additional seventeen being made ill.⁶ The loss of life was tragic, but the attack had second order effects as the US postal system was shutdown in order to address the situation. The investigation and subsequent criminal case involved multiple US Government departments ranging from the Federal Bureau of Investigation,

² Filippa Lentzos, "The Risk of Bioweapons use: Considering the Evidence Base," *BioSocieties* 9, no. 1 (March 2014): 84-93.

³ The term WMD tends to be the preferred US term with CBRNE as a subset within the field. Canadian preference leans towards CBRNE but some government documents still make use of WMD.

⁴ CBRNE is the materials, dispersal devices and requisite knowledge to create them. This term shall be used throughout as opposed to Weapon of Mass Destruction (WMD) as the amount of damage inflicted is less important than the effects on the moral plane. The term Weapon of Mass Effect (WME) is used in some studies to account for the importance of the psychological over the physical but although preferred by the author, this term has yet to be fully accepted within the field.

⁵ Federal Bureau of Investigation, “Famous Cases: Amerithrax Investigation,” last accessed 11 February 2014. <http://www.fbi.gov/about-us/history/famous-cases/anthrax-amerithrax>.

⁶ Federal Bureau of Investigation, “Famous Cases: Amerithrax Investigation,” last accessed 11 February 2014. <http://www.fbi.gov/about-us/history/famous-cases/anthrax-amerithrax>.

US Postal Service and various scientific entities, each having a key role to play, but complicating the solution by adding to its complexity.⁷

Prior to Amerithrax on the 20th of March 1995, the terrorist organisation known as Aum Shinrikyo released Sarin into the Tokyo subway system.⁸ This attack caused widespread panic and overwhelmed the local emergency services and hospitals. The objective however was more calculated than just terror. The attack was aimed at interfering with a police investigation into the group by killing multiple law enforcement personnel who used this transit system daily.⁹ Here a small fanatical organisation managed to obtain illicit knowledge of CBRNE and the requisite precursor chemicals, successfully producing and employing a device to further their aims.

These attacks pale compared to the efforts a well-funded and organised terrorist group such as Al Qaeda has made to obtain a CBRNE device.¹⁰ In 1993 Al Qaeda personnel attempted to obtain nuclear material in the Sudan followed in 1996 when an Al Qaeda Lieutenant was arrested in Russia for attempting to illicitly obtain a complete

⁷ Federal Bureau of Investigation, "Famous Cases: Amerithrax Investigation, Fact Sheet," last accessed 11 February 2014, <http://www.fbi.gov/about-us/history/famous-cases/anthrax-amerithrax/amerithrax-fact-sheet>.

⁸ Erica Simons, "Faith, Fanaticism, and Fear: Aum Shinrikyo - The Birth and Death of a Terrorist Organization." *Forensic Examiner* 15, no. 1 (Spring, 2006): 37-45.

⁹ Yasua Seto, "The Sarin Gas Attack in Japan and the related forensic investigation," *OPCW Synthesis – The Sarin Gas Attack* (June, 2001), 16.

¹⁰ Graham Allison. "Is Nuclear Terrorism a Threat to Canada's National Security?" *International Journal* 60, no. 3 (Summer, 2005): 716.

nuclear weapon.¹¹ Again in 1999 Al Qaeda looked to obtain a device, this time by recruiting a biologist and acquiring the equipment for the production of a biological weapon.¹² The program although advanced was cancelled as it did not fulfill the desired vision. The threats were amplified by Osama Bin Laden in 2001 when he stated that Al Qaeda would deter US aggression in Afghanistan with chemical and nuclear weapons. Al Qaeda's threat of chemical weapons gained credibility in February of 2003 when the US tipped off the United Kingdom, Spain, France and Italy to a terrorist plot evolving in their countries with subsequent investigations and arrests proving the threat to be credible.¹³ Most disturbing has been the supposed intercept of shipments of highly enriched uranium (HEU) in Georgia in 2003, 2006 and 2009, supposedly samples to prove the quality of a much larger material stockpile.¹⁴ Thus far assessments state that the largest impediment to an Al Qaeda attack is the desire to execute a single large scale attack which would bring about a significant change, as opposed to smaller less effective attacks which they may already be capable of.¹⁵

Thus the concepts associated with anthrax, Sarin or a nuclear device are able to illicit an emotional response within the general population far greater than the destructive

¹¹ Rolf Mowatt-Larssen, "Al Qaeda Weapons of Mass Destruction: Hype or Reality," *Harvard Kennedy School, Belfer Centre for Science and International Affairs* (January 2010), 11.

¹² Mowatt-Larssen, "Al Qaeda Weapons of Mass Destruction"..., 13.

¹³ Mowatt-Larssen, "Al Qaeda Weapons of Mass Destruction"..., 25.

¹⁴ Mowatt-Larssen, "Al Qaeda Weapons of Mass Destruction"..., 25-28.

¹⁵ Mowatt-Larssen, "Al Qaeda Weapons of Mass Destruction"..., 7.

capabilities of the weapons.¹⁶ Simply causing a population to believe they were affected leads to a condition known as the “the worried well” which causes healthy individuals to overwhelm the medical system due to perceived symptoms.¹⁷ The impacts on society are thus far greater than the physical damage or the death toll that these devices deliver. Given the combination of physical and psychological damage that these devices cause, they receive special attention in the world particularly by states fearing that they may be used against their interests.¹⁸

Ensuring that CBNRE devices are not used has been codified in multiple treaties binding states to neither develop nor employ these weapons. This is not to say that all states follow the international laws, but it does provide a framework. Additionally, the concern has now turned away from states and focuses on non-state or state-sponsored individuals, actors and groups making use of these weapons to further their own objectives. In response to this, the concepts of non-proliferation¹⁹ and counter proliferation²⁰ have become increasingly important as part of national defence plans and policies. These leads to the idea of stopping an attack prior to it occurring colloquially

¹⁶ Adam Day, “The Dragon Hunters,” *Legion Magazine* (September 2009), 38.

¹⁷ Fred Stone, “The Worried Well, Response to CBRN Events. Analysis and Solutions” *The Counter Proliferation Papers, Future Warfare Series* no. 40 (Maxwell Airforce Base Alabama: USAF Counter Proliferation Center, 2007), 2.

¹⁸ Jonathan M. McComb, “Closing Pandora’s Box: The Threat of Terrorist Use of Weapons of Mass Destruction,” *Global Security Studies*, Volume 4, Issue 171 (Winter 2013), 72.

¹⁹ For this paper, non-proliferation constitutes activities taken at the strategic level to stop the proliferation of CBRNE materials and knowledge.

²⁰ For this paper, counter proliferation is defined as activities taken at the operational and tactical levels in effect the proliferation of CBRNE materials.

referred to as “left of bang” activities.²¹ In the event of an attack, states have placed efforts into incident response²² frameworks and recuperation protocols in consequence management.²³ Although the concept of counter proliferation itself is not new, the field is still growing and developing, trying to develop a solution to a problem which is difficult to define.

Canada, The Canadian Armed Forces and CBRNE

Trends in Canada show that there is an increase in domestic terrorism and that these trends are likely to continue.²⁴ An attack on Canada using a CBRNE device could either take place directly against a Canadian city or indirectly as Canada is used as a springboard for an attack on an ally. Either case would cause massive ramifications to the country either in direct damage or economic second order effects.²⁵ With an increase in domestic terrorism in Canada and the possibility that these may lead to the use of a CBRNE device, consideration must be given to prevent the event from ever occurring.

²¹ With “bang” being the detonation of a device or the event, all “left of bang” activities are those activities in the non and counter proliferation realms designed to stop the event from occurring.

²² Immediate Response activities are the immediate actions taken by first responders in response to an incident.

²³ Consequence Management activities are the long term restorative efforts to re-establish pre event conditions to include repair to infrastructure, way of life and public confidence.

²⁴ Michael Zekulin, "Terrorism in Canada," *Journal Of Military & Strategic Studies* 13, no. 3.(Spring 2011): 2.

²⁵ Allison, "Is Nuclear Terrorism a Threat...", 717.

As such in the Canada First Defence Strategy (CFDS)²⁶ the defence of Canada is the primary role of the Canadian Armed Forces (CAF). This role is further defined in the six core tasks, which encompasses the domestic realm in both defence against a conventional threat through the conduct of domestic operations and response to a major terrorist attack.²⁷ The idea of responding to a terrorist event is indicative of the current CAF mindset within the domestic environment which focuses on routine operations or responsive operations as opposed to pre-emptive. Given the possible outcomes of a CBRNE event in Canada counter proliferation efforts would seem prudent but remain difficult as this requires the CAF to act in support of Other Government Departments (OGDs). Participating in counter proliferation is further complicated by the existing planning paradigm, which is optimised for routine operations and emergency response. The CAF does not have a leadership role in counter proliferation activities, nor should it look to assume one, however given the unique assets available to the CAF, the institution must seek to play an enabling role ensuring that assets are properly prepared and integrated as part of a possible solution.

The Problem

As the proliferation of CBRNE threats remains an option for non-state actors to pursue an agenda and given the severity of a major terrorist attack on Canada making use of CBRNE, efforts to avert an attack prior to its occurrence are prudent. The difficulty

²⁶ Department of National Defence, *Canada First Defence Strategy*, (Ottawa: DND Canada), 7.

²⁷ Department of National Defence, *Canada First Defence Strategy...*, 10.

however is determining what should the CAF be doing in support of counter proliferation efforts? What activities should the CAF take and what effects should they be looking for? Who should they be partnered with and when should they be acting on our own? In analysing these questions it becomes apparent that we cannot find a solution given the existing CAF planning paradigm. The existing paradigm is linear in its approach while the problem being addressed is non-linear in nature. In addressing the wicked problem which is counter proliferation, a nonlinear approach is required, and the use of design theory should be adopted by the CAF for this particular problem set. Design theory itself is based on nonlinear problem solving methods developed within the social sciences. These methods are appropriate to address the wicked nature of the problem. By adopting these non-linear problem solving methods, the CAF can better understand their role and possible contributions to Canadian counter proliferation efforts. This would assist in meeting the CAF mandate of defence of Canada, specifically against a CBRNE event from which the country's recovery from an event would be long and arduous.

Methodology

In demonstrating the value of design theory in addressing counter proliferation problems, the problem space itself shall be explored in some detail. Although not all elements shall be considered, enough detail shall be given to show the enormity of the problem. In order to depict the various interactions and their effects, a series of gears shall be depicted. Each gear shall be acting on the problem space in order to influence an event. The "event" is a successful attack on Canada or Canadian interests using a

CBRNE device which has been proliferated to a hostile non-state or state sponsored actor. Each gear represents an element which can be present in the system, but does not imply that it must be present. Additionally, each gear can positively or negatively influence the problem space or provide no influence at all. Gears may also intentionally or unintentionally create friction on the system either by opposing counter proliferation efforts or by slowing the system down or opposing it. The gear model being used throughout has flaws in properly displaying certain concepts, but is seen as adequate for this work. There will be cases where gears are overlapping one another as the model is expanded. As this is a two dimensional image, consider the gears to be on separate planes both above and beyond the main gear, allowing the gears to move and interact as necessary.

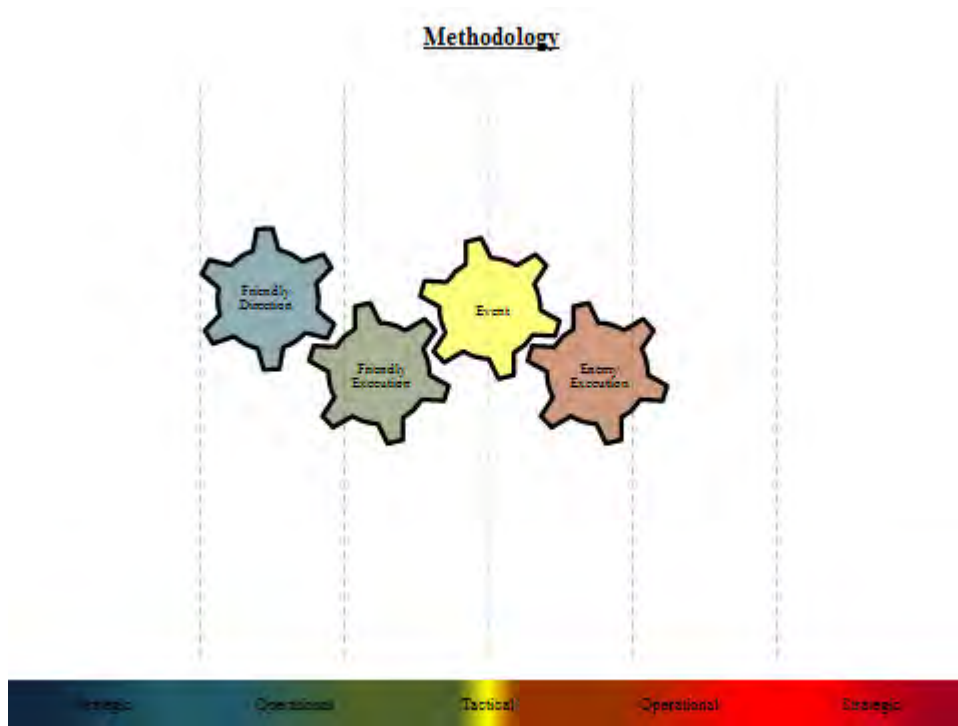


Figure 1: Methodology

Once the problem space is defined in sufficient detail, an analysis shall be conducted to demonstrate that the problem space represents a wicked problem. Being a wicked problem is important as it influences the nature of the problem itself and the means of addressing the issue. In order to solve the problem, a review of the existing paradigm the Operational Planning Process (OPP) shall be conducted followed by an analysis of the fundamental science behind the process. This is to demonstrate that the process is linear and cannot be adapted to a nonlinear problem. Nonlinear problem solving methods shall than be introduced concluding with a review of design theory, the resultant planning paradigm of nonlinear problem solving methods. Finally, the theory

shall be brought together to demonstrate how design theory could possibly be applied to the wicked problem of counter proliferation.

Scope

This project does not aim to account for the entire problem space being explored or provide guidance and options to the CAF. The problem space itself shall be built with enough detail to demonstrate the breadth of the problem. The specific elements within the problem shall be defined only in so far as they may be seen to influence the environment of counter proliferation activities. For the CAF, guidance on specific tasks or possible responsibilities shall be limited to a finite number of specific elements. This paper does not aim to prescribe a solution, but to demonstrate that the existing planning paradigm is not capable of addressing the issue.

CHAPTER 2: PROBLEM SPACE

Introduction to problem Space

As the problem space is exposed we begin to understand both the scope and depth of the problem being encountered. This is positive as it helps us to understand the type of problem being addressed where comprehension of the problem space has more lasting benefits than comprehension of the solution space.²⁸ In developing a fairly complete picture of the problem space, the existing planning paradigm used by the CAF shall be reviewed. This is done in order to express the current mindset of CAF planners as they approach problems. Looking at counter proliferation specifically, a review of the factors affecting counter proliferation efforts shall be undertaken. In accordance with CAF doctrine, the counter proliferation elements shall be broken into those elements affecting the strategic, operational and tactical levels. Once the key friendly factors are analysed, the friendly model shall be simplified to aid in further analysis. The enemy or proliferator model shall then be built in a similar fashion reviewing strategic, operational and tactical level elements. Reviewing the enemy and friendly together shall lead to an analysis of the effect of a successful attack by the enemy and where the attack is felt. Finally, an analysis of the complete counter proliferation problem space shall look to define the problem space as wicked in nature. All of this is in order to build a baseline understanding of the key elements which affect the planning environment which must be considered.

²⁸ Kostas Kiriakakis, "A day at the park," last accessed 7 January 2014, <http://kiriakakis.net/comics/mused/a-day-at-the-park>.

Understanding this environment aids later efforts to understand the methods required to resolve the problem.

Existing Paradigm

The Canadian Forces conducts operational level planning using the Operational Planning Process (OPP).²⁹ This process shall be explored in greater detail later. The OPP allows for clear strategic direction as developed by the Government of Canada (GoC) to be passed to the operational level, interpreted and resourced, resulting in tasks and missions to the tactical level.³⁰ The same can be seen from the enemy perspective. Graphically using our gear model, this concept is laid out as follows:

²⁹ Department of National Defence, *Canadian Forces Joint Publication (CFJP) 5-0 The Canadian Forces Operational Planning Process*, (Ottawa: DND Canada), 1-1.

³⁰ DND, *CFJP 5-0...*, 1-2.

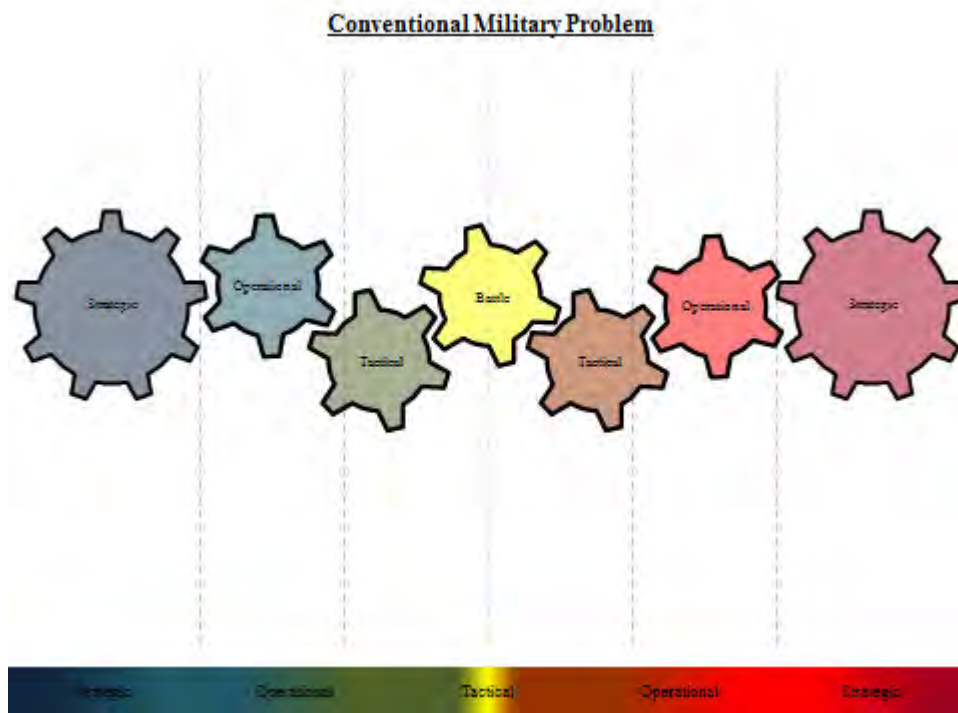


Figure 2: Conventional Military Problem

From this model we begin to see the linear nature of the passage of direction and information through the system. Key to this is the interplay between the strategic and operational, followed by the operational and tactical, and finally between the tactical and the event. This model shall be explored to see how it applies to counter proliferation activities.

Friendly: Strategic Level

The strategic level is the highest level of planning and coordination and encompasses the expression of government intent. Additionally, the strategic level provides the high level rules through acts, treaties and conventions which govern the system of interactions. It is impossible to account for all elements within the framework

as Canada is party to over 140 agreements with respect to countering terrorism alone.³¹ Within the CAF context, strategic doctrine is the foundation of all military doctrine and establishes the framework for the use of military resources and force.³² The strategic level has been broken into two separate elements, the domestic and international strategic environments.³³

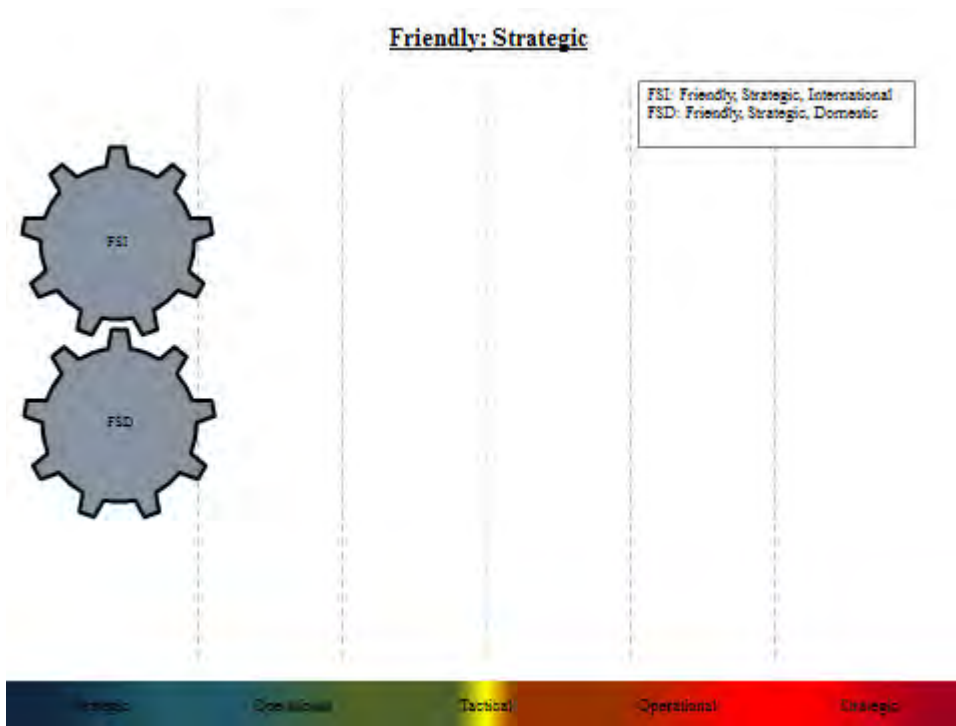


Figure 3: Friendly, Strategic

³¹ Zekulin, "Terrorism in Canada." ..., 13.

³² Department of National Defence, *Canadian Forces Joint Publication 01: Canadian Military Doctrine*, (Ottawa: DND Canada), 1-2.

³³ Tim Dunne and Brian C Schmidt, "Realism," *The Globalisation of World Politics*, 5th edition, ed John Bayliss, Steve Smith and Patricia Owens, 85-98 (Oxford: Oxford University Press, 2011), 87.

Friendly: Strategic International

Chemical Weapons Convention (CWC): The CWC came into force on the 29th of April, 1997 and as of the 14th of October, 2013, 190 countries have signed and ratified the convention, while two have signed yet not ratified³⁴ and four have neither signed nor ratified the convention.³⁵ The goal of the convention is to completely remove the use of chemical weapons from use in warfare while still protecting the peaceful use of chemicals for the betterment of all.³⁶ Key to the convention is the establishment of controls and checks which still allow for peaceful research to include defensive research against chemical weapons.³⁷ The checking mechanism is handled by an operational and tactical level organisation, the Organisation for the Prohibition of Chemical Weapons (OPCW). The CWC is important to the problem space in that it provides an international legal framework for the control of chemicals which can be used for weapons purposes.³⁸ This influences the manner in which states approach these specific materials and influences the regulations that a proliferator must overcome to obtain materials.

³⁴ Israel and Myanmar.

³⁵ Angola, Democratic People's Republic of Korea, Egypt and South Sudan.

³⁶ United Nations, *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction*, (Geneva, 3 September 1992), preamble.

³⁷ UN, *CWC...*, preamble.

³⁸ Jonathon B. Tucker, "The Chemical Weapons Convention: Has it enhanced U.S. security?," *Arms Control Today*, (Apr 2001): 12.

Biological and Toxin Weapons Convention (BTWC): The Convention on the Prohibition on the Development and Stockpiling of Bacteriological (Biological) and Toxin Weapons entered into force on the 26th of March, 1995. 155 states have signed and ratified the convention with sixteen having signed and not ratified³⁹ and an additional 23 states being non-signatories to the convention.⁴⁰ Similar to the CWC, the BTWC aims to eliminate biological warfare while still allowing for peaceful advancement of biological research and technology.⁴¹ However, the BTWC lacks the same degree of checks and reporting that is inherent to the CWC. The BTWC is important to the problem space as any attempt to proliferate biological materials or associated knowledge between or within a state is seen as a breach of the convention. Although the convention only applies to the signatories, it provides some legal framework to the problem space with respect to the use of biological weapons.⁴² Additionally it provides legal authority for states to protect their biological research while creating obstacles for the proliferators' attempts to gain this material and knowledge.

³⁹ Burundi, Central African Republic, Côte d'Ivoire, Egypt, Gabon, Guyana, Haiti, Liberia, Madagascar, Malawi, Myanmar, Nepal, Somalia, Syrian Arab Republic, United Arab Emirates and United Republic of Tanzania.

⁴⁰ Andorra, Angola, Cameroon, Chad, Comoros, Cook Islands, Djibouti, Eritrea, Guinea, Israel, Kazakhstan, Kiribati, Marshall Islands, Mauritania, Micronesia (Federal States of), Mozambique, Namibia, Nauru, Niue, Samoa, Trinidad and Tobago, Tuvalu and Zambia.

⁴¹ United Nations, *Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction*, (Moscow and Washington, 1972), preamble.

⁴² UN, *BTWC...*, preamble.

Nuclear Non Proliferation Treaty (NPT): The NPT was brought into effect on the 5th of March, 1960. There has been one withdrawal from the treaty⁴³ and there are four non-signatories.⁴⁴ Similar to the other treaties, the NPT aims to eliminate nuclear weapons from the world while allowing for the development and use of nuclear resources for peaceful purposes.⁴⁵ The NPT is monitored through the International Atomic Energy Association (IAEA).⁴⁶ The treaty is important to the problem space as a legal framework which influences the activities of signatory states, compelling them to protect their own nuclear weapons capabilities while denying the capability to others. The specifics of this treaty with respect to signatories and non-signatories provide proliferators avenues which may be exploited as non-signatories are not bound to the protocols within the treaty.

Australia Group: The Australia Group is a non-legally binding and informal group with the aim of sharing best practices for the disruption in the trafficking of chemical and biological materials that can be used for weapons.⁴⁷ Canada is one of 42 member countries to the group. This group is of interest to the problem space as a representative of many likeminded groups. It demonstrates that there are strategic level initiatives and

⁴³ Democratic People's Republic of North Korea.

⁴⁴ India, Israel, Pakistan and South Sudan.

⁴⁵ United Nations, *Nuclear Non-Proliferation Treaty*, (Geneva, 1970), preamble.

⁴⁶ United Nations: International Atomic Energy Association, "About us," accessed 15 March 2014. <http://www.iaea.org/About/>.

⁴⁷ Australia, *The Australia Group*, last accessed 22 April 2014. <http://www.australiagroup.net/en/origins.html>.

agreements between smaller numbers of groups that may influence and inform counter proliferation activities.

United Nations Security Council Resolution 1540 (UNSCR 1540): UNSCR 1540 was adopted by the United Nations Security Council on the 28th of April 2004, originally under a two year mandate which has been continuously renewed. The goal of UNSCR 1540 is to call upon nations to ensure that CBRNE knowledge and materials do not proliferate to non-state actors, affirming that this is a threat to international peace and stability. It further calls on states to stop support to non-state organisations trying to obtain a CBRNE capability while safeguarding their own capabilities. Finally, within existing laws and treaties, UNSCR 1540 calls upon States to intercept illicit movement of CBRNE materials.⁴⁸ UNSCR 1540 has considerable influence on the problem space as it compels all UN members to stop the proliferation of capabilities to non-state actors while not granting any new powers. This specific targeting of non-state actors acknowledges the concern these organisations create to international peace and stability. The specifics of this treaty are a major influence to counter proliferation activities in that it is the first major resolution that acknowledges the threat of non-state actors possessing CBRNE materials to international peace and stability. Despite acknowledging the threat however, the enforcement powers associated with the resolution are limited.

⁴⁸ United Nations, *United Nations Security Council Resolution 1540*, (April 28, 2004).

Proliferation Security Initiative (PSI): The PSI is a US initiative that looks to take the principles within UNSCR 1540 and further. This is done through a statement of interdiction principles which outline specific measures states must take to counter proliferation efforts. 102 countries currently participate in the PSI augmented by a further 11 bilateral agreements between the US and various States to expedite ship boarding activities. Despite the level of participation, the legality of the agreement has often been questioned as specific states feel that the agreement specifically targets them.⁴⁹ For signatory states however, the agreement implores them to stop the shipment of CBRNE materials⁵⁰ and where legally possible to intercept state flagged vessels believed to be carrying CBRNE materials. The document further implores states to authorise other signatory states to board their vessels when reasonable grounds to search a vessel is provided. The PSI has an effect on the problem space as it provides a treaty framework under which certain counter proliferation efforts can take place.

⁴⁹ United States of America: Department of State, *Proliferation Security Initiative*, last accessed 22 April 2014. <http://www.state.gov/t/isn/c10390.htm>.

⁵⁰ The PSI makes use of the term Weapon of Mass Destruction as opposed to CBRNE.

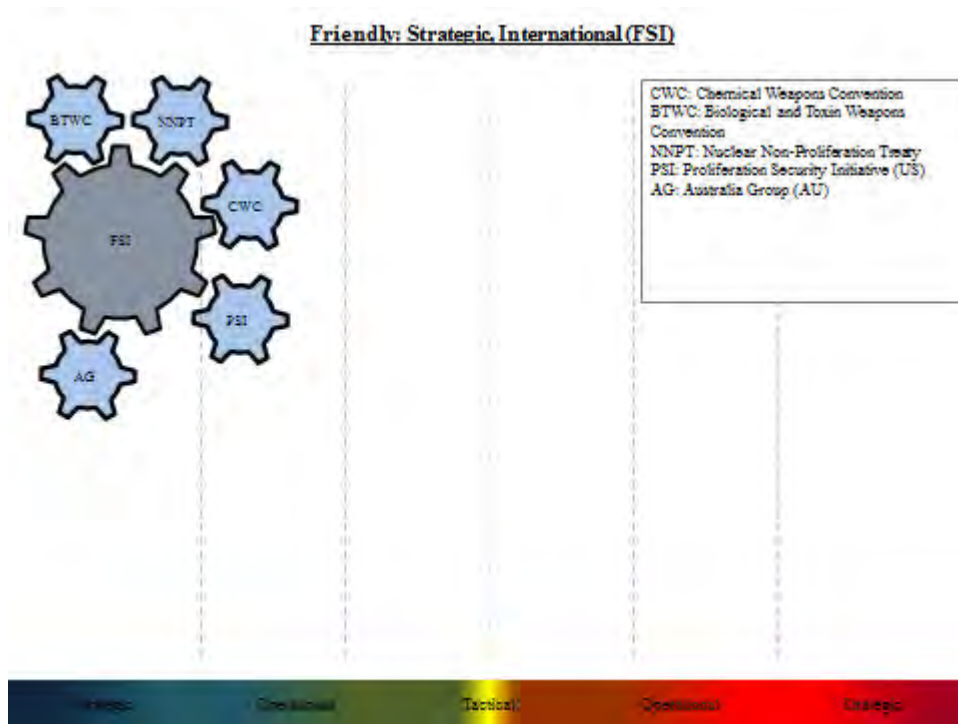


Figure 4: Friendly, Strategic International

Friendly: Strategic Canadian

The Government of Canada Operations Centre (GOC): The GOC is a continuously manned and operated operations centre whose function is to ensure whole of government (WoG) situational awareness ensuring all parties are planning off of a common operating picture. The GOC therefore ensures that the strategic level within the government is capable of making timely decisions during a crisis while remaining up to date on events. The duties of the centre typically focus on warning, reporting and crisis

response with some coordination functions as part of a WOG response to a situation.⁵¹ As such, the GOC focuses on impending or occurring events and is not focused on long term planning. The GOC is important to the problem space as it is the mechanism by which the strategic level receives information on an occurring incident and subsequently influences the system, but does not conduct long term planning.

Public Safety Canada (PSC): Public Safety Canada is the federal department responsible for the strategic level development of domestic security policy. Although the Royal Canadian Mounted Police (RCMP), Canadian Border Services Agency (CBSA) and the Canadian Security Intelligence Service (CSIS) are resident under PSC, they are not responsible to report through them as their actions are regulated under separate acts. PSC is directly responsible for the operation of the GOC as part of its strategic level roles and responsibilities.⁵² Due to their strategic influence over policy, counter proliferation efforts are heavily influenced by PSC. Counter proliferation planning must account for this influence while acknowledging the links between the RCMP, CSIS, CBSA and PSC and the various mandates of the organisations.

Chemical, Biological, Radiological, Nuclear and Explosives Resilience Strategy (CBRNE Strategy): This is the strategy for the Government of Canada as prepared by the Ministry of Public Safety Canada (PSC) in January of 2011. In accordance with PSC

⁵¹ Government of Canada, "Government Operations Centre (GOC)," last accessed 22 April 2014. <http://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/rspndng-mrgnc-vnts/gvrnmnt-prtns-cntr-eng.aspx>.

⁵² Government of Canada, "Public Safety Canada, About Public Safety Canada", last accessed 22 April 2014. <https://www.publicsafety.gc.ca/cnt/bt/index-eng.aspx>.

doctrine the model is organised in terms of the actions of prevention, preparedness, response and recovery.⁵³ The prevent aspect with respect to this strategy is not actually focused on the prevention of an event but the mitigation measures such as that of building codes that are put in place to ensure that if an event takes place that the effect is minimised. As such, the strategy does not consider counter proliferation activities as part of the GoC strategy. This is a key influence on the problem space as it demonstrates a GoC focus on response as opposed to a more counter proliferation based mandate.

Chemical, Biological, Radiological, Nuclear and Explosives Resilience Action Plan (CBRNE Plan): The follow on to the CBNRE Strategy and released in January of 2011 is the CBRNE Plan. Like the strategy, it is an overarching government document but once again focuses on how to handle an event as opposed to preventing the event from occurring.⁵⁴ The document is focused on the first responder community and does not make specific mention for the Canadian Forces or Department of National Defence. This causes friction in counter proliferation as the department and its capabilities are not explicitly mentioned, while the concept of preventing the event is ignored. The specifics of this document and their definition of the solution space must be considered as those following this guideline will not be cognisant of all factors in the problem space.

⁵³ Government of Canada, *Chemical, Biological, Radiological, Nuclear and Explosives Resilience Strategy for Canada*, (Canada: Ministry of Public Safety, 2011).

⁵⁴ Government of Canada, *Building Resilience Against Terrorism: Canada's Counter-Terrorism Strategy*, (Canada: Ministry of Public Safety, 2011).

Building Resilience Against Terrorism: Canada's Counter-Terrorism Strategy

(CT Strategy): This document also produced by PSC and further extolls the concepts of prevent, detect, deny and respond. However the CT Strategy expands the prevent phase to include terrorist motivation, which requires strategic means to influence so would count under non-proliferation activities. Although not CBRNE specific, the document makes mention of the need to deny terrorist the ability to conduct an attack, providing some framework to counter proliferation activities.⁵⁵ Because of this, we see that the CT Strategy has more influence on counter proliferation activities than the CBRNE Strategy, although both must be considered. In a way, the counter proliferations problem space aligns better with counter terrorism efforts than it does counter CBRNE efforts. The correctness of this can be debated, but awareness of the influence on the problem space is important.

Department of National Defence (DND): The Department of National Defence with the Canadian Armed Forces (CAF) as a sub component is an interesting player within the counter proliferation realm which is often overlooked as it is not the lead agency either domestically or abroad for this issue. This lack of lead agency status at the strategic level is counterbalanced by a broad spectrum of pertinent capabilities (to be discussed later) at the tactical level. This affects the problem space as this tactical capability gives the DND and CAF some influx into the problem at the strategic level,

⁵⁵ Government of Canada, *Chemical, Biological, Radiological, Nuclear and Explosives Resilience Action Plan for Canada*, (Canada: Ministry of Public Safety, 2011).

which is exerted through the Minister of National Defence (MND) and Chief of Defence Staff (CDS) through the Strategic Joint Staff and Adm (Policy).

Laws: Various federal Canadian laws provide a framework by which counter proliferation activities take place. These laws can dictate the ways and means which are acceptable to achieve the various ends. Laws, such as Bill S-7 the Combatting Terrorism Act, provide legal framework which counter proliferation activities must follow.⁵⁶

Influencing the problem space, knowledge of the various laws and acts is critical in ensuring that solutions provided do not function in a direction opposite the legal gear. In a case where a solution is contrary to the legal gear and crown prerogative must be executed, knowledge of how the legal gear works is critical in ensuring that this does not become an impediment on the overall solution.

Government Intent: Key to the strategic domestic situation is that of the GoC intent the driving factor behind Canada's actions strategically as a nation. This intent is influenced predominately by the people of Canada as represented by the government. As the people are the target of terrorist activities, the need to counter threats to the population must be carefully considered against the need to have the government of Canada responsive to the people of Canada ensuring that the government is acting in the best interest of Canada and Canadian citizens. Also capable of influencing the intent of the government are Non-Government Organisations (NGOs) which may have any

⁵⁶ Canada, *Bill S-7: The Combatting Terrorism Act*, (Canada, 2013).

number of reasons for wanting the government to take a particular viewpoint on a subject. These can be religious, ideological or industrial/commercial in nature. Finally, through the department of foreign affairs (who act as a link between the domestic and international strategic) the government is capable of influencing other states on their proliferation policies. This is the key method of conducting non-proliferation activities.

Department of Foreign Affairs Trade and Development (DFATD): The DFATD is a key player within both the non and counter proliferation realms. For non-proliferation activities, they are the sole voice of the government of Canada to influence the treaties and agreements that Canada is signed onto thereby greatly influencing the strategic space for Canada.⁵⁷ This is voiced through the non-proliferation and disarmament division. As the lead voice of Canada to the international community on most counter proliferation activities, the viewpoint of DFATD on key issues must always be considered with respect to its influence on the problem space.

⁵⁷ Canada: Department of Foreign Affairs, "Non-Proliferation and Disarmament Division," accessed 15 March 2014. <http://www.international.gc.ca/arms-armes/index.aspx>.

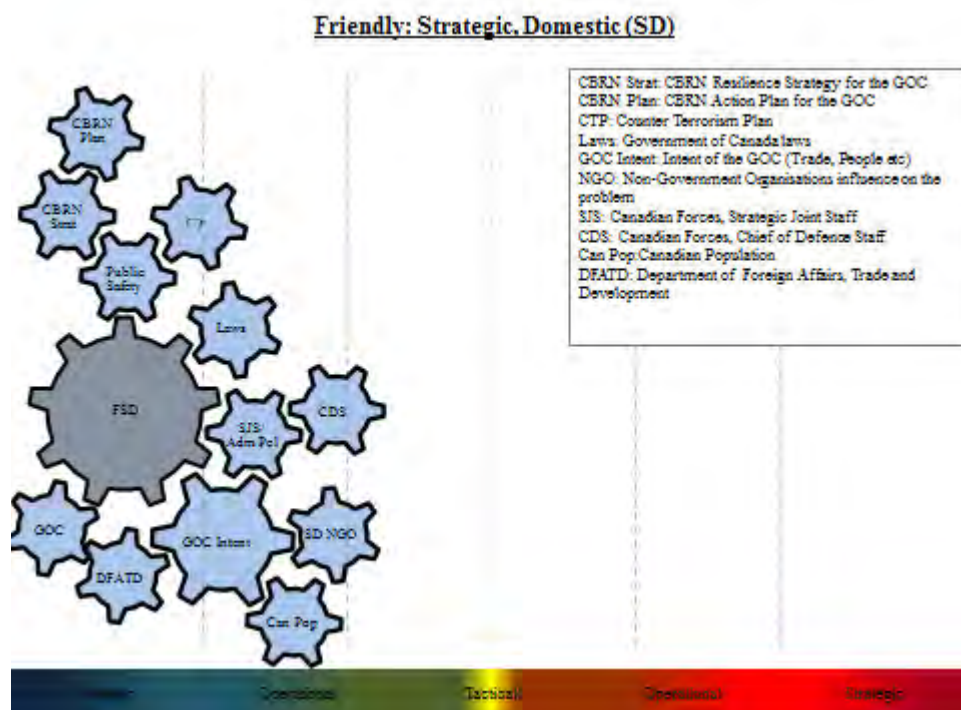


Figure 5: Friendly, Strategic Domestic⁵⁸

Greatly influenced by the people of Canada through the government we see that the Canadian strategic level with respect to counter proliferation activities is highly complex. The interaction with this portion of the system on the rest of the gears shall be further analysed but care must always be taken to consider the people of Canada and their influence.

⁵⁸ As the model presented is 2D in nature we see the overlap of gears. In this case, the gears are on different planes (or levels) thereby not necessarily interfering with each other. This is akin to looking into a complicated timepiece and seeing the various levels of gears interacting.

Friendly: Strategic Conclusion

At the strategic level, we begin to see the complexity of the issue of counter proliferation in that there are numerous interests at play which can affect the situation and that the knowledge base required to engage the problem is incredibly wide and varied. Also, we see that certain organisations are capable of influencing the system in multiple ways such as foreign affairs which can influence and act on government intent, but can also influence the international strategic picture. All of this combined forms the following strategic level counter proliferation framework from a counter proliferator perspective.

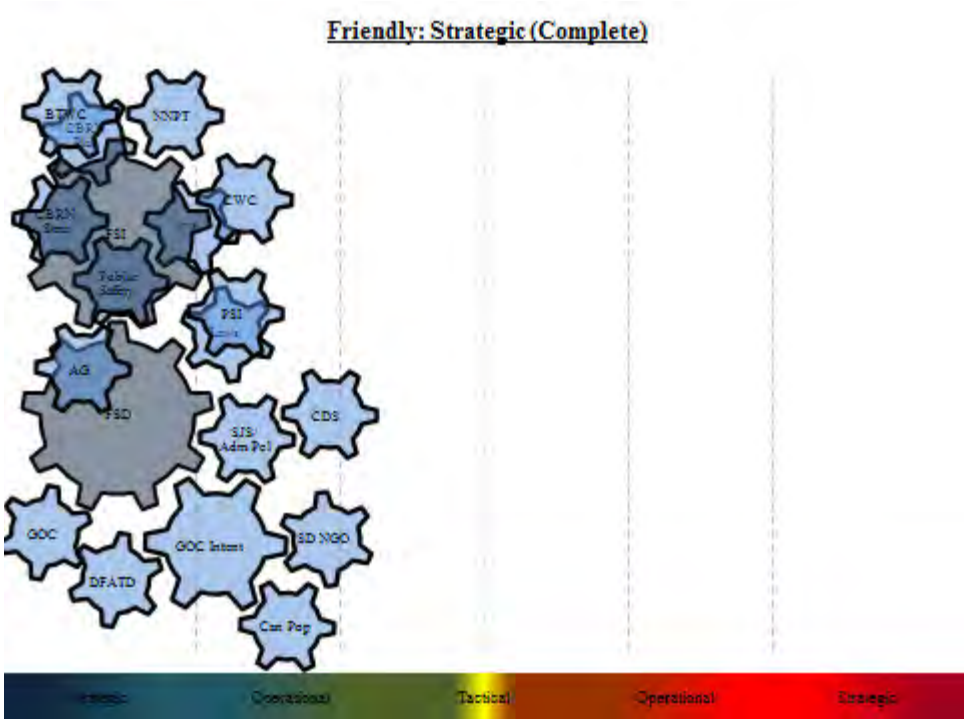


Figure 6: Friendly, Complete Strategic

Friendly: Operational Level

The operational level is predominately a Canadian Forces term and does not fully equate across all levels of government. However as we analyse other organisations we realise that they all tend to have this operational, or middle management layer to them. For the purpose of this argument, the operational layer shall be seen as the institutions between the strategic and tactical levels which enable the strategic concepts to be passed on as tactical direction. Operational doctrine applies the principles of strategic doctrine to military actions by describing the use of armed forces in the context of distinct objectives, force capabilities, generic mission types and operating environments.⁵⁹ The operational level has been divided into Operational International, Operational Government of Canada and Operational Canadian Armed Forces elements.

⁵⁹ CFJP 01..., 1-3.

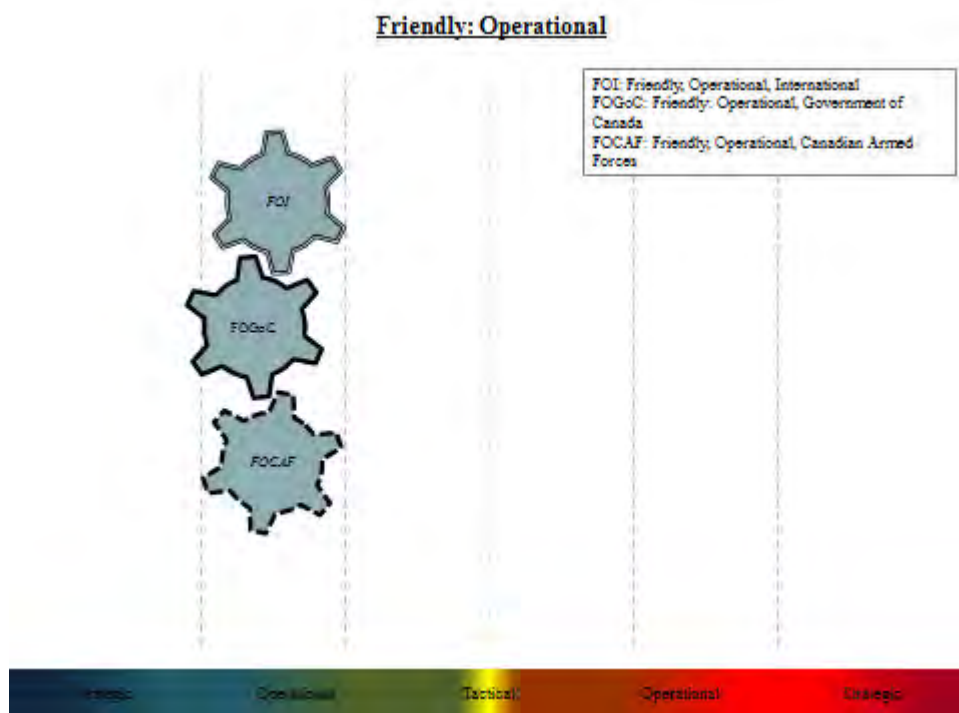


Figure 7: Friendly, Operational

Friendly: Operational International

Organisation for the Prohibition of Chemical Weapons (OPCW): The operational level to the CWC is the OPCW which acts as a monitoring, inspection and reporting agency.⁶⁰ The OPCW influences the problem space as an element which takes part in the verification and monitoring of known stockpiles building. This builds the internationally accepted definition of the problem in terms of which countries possess what materials in what quantities.

⁶⁰ Organisation for the Prohibition of Chemical Weapons, "Our Work," last accessed 18 March 2014, <http://www.opcw.org/our-work/>.

International Atomic Energy Association (IAEA): The IAEA is the operational level which conducts monitoring and reporting of nuclear material and knowledge transfer internationally. The IAEA is important as a legal mechanism which must be informed and engaged when dealing with the theft, loss or recovery of nuclear material.

Defence Threat Reduction Agency (DTRA): DTRA is a US Department of Defence (DOD) agency responsible for the coordination of counter proliferation efforts across the US military.⁶¹ Task Force Elimination is assigned to DTRA as a tactical element with specific capabilities in support of the DTRA mandate.⁶² Key to the DTRA mandate is the coordination of Proliferation Security Initiative exercises and activities. DTRA influences the counter proliferation problem space as a major agency within a key player for counter proliferation activities. It is likely that any counter proliferation activities will in some way affect allied plans and must therefore be coordinated appropriately.

North Atlantic Treaty Organisation (NATO): NATO is seen as an operational level element as strategic decision making is held under State control and is handled between States. Given the international nature of proliferation activities, NATO coordination is seen as an enabler to activities, specifically with respect to concerns of

⁶¹ Defence Threat Reduction Agency, "About Us," last accessed 18 March 2014, <http://www.dtra.mil/About.aspx>.

⁶² Defence Threat Reduction Agency, "TF Elimination," last accessed 18 March 2014, http://www.dtra.mil/docs/system-documents/DTRA_Fact_Sheet_-_23_May_2012.pdf?sfvrsn=0.

old material moving in and out of the old Soviet Union.⁶³ More importantly, any actions taken by Canada need to be coordinated against the actions being taken by partners to ensure that redundancy or counterproductive activities are not occurring ensuring the greatest benefit to Canada.

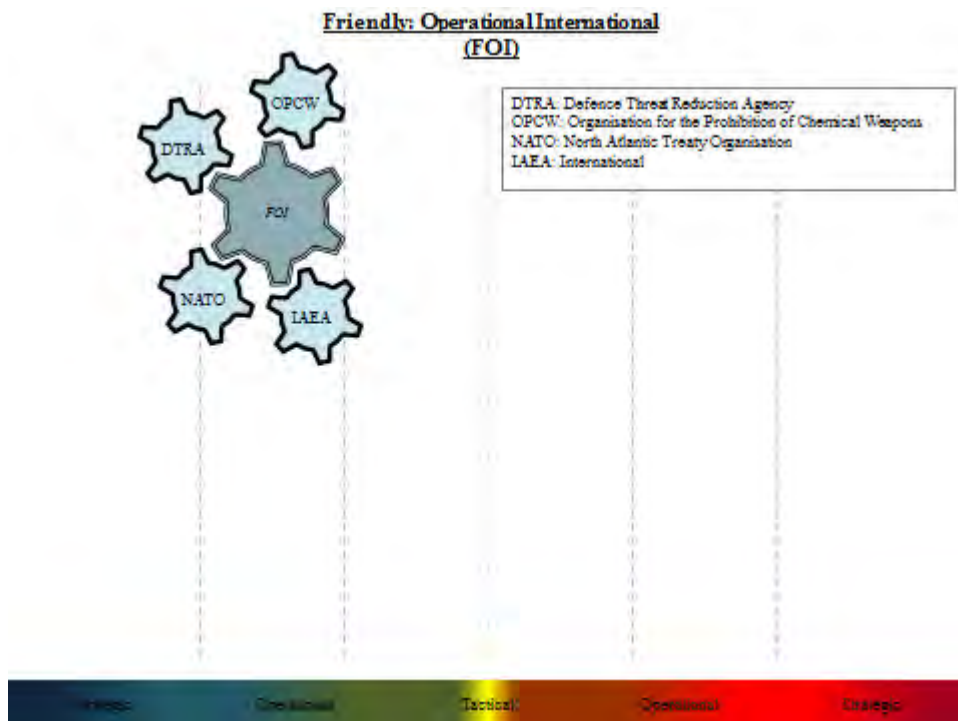


Figure 8: Friendly, Operational, International

Friendly: Operational Government of Canada

Royal Canadian Mounted Police (RCMP): The operational level element of the RCMP is the National Operations Centre (NOC). This operational level headquarters

⁶³ North Atlantic Treaty Organisation, “Weapons of Mass Destruction,” last accessed 19 March 2014, http://www.nato.int/cps/en/natolive/topics_50325.htm?selectedLocale=en.

provides a command and control centre as well as collaboration element in response to events. Collaboration is achieved through a set of liaisons from various government departments. Given the security nexus to a proliferation event affecting Canadians and the need for law enforcement involvement, the NOC becomes a key node as proliferation activities get closer to becoming actual events. In the event just prior to an event occurring, the NOC will become a focal point of activity if the government is looking at a law enforcement aspect to the problem.

Canadian Border Services Agency (CBSA): CBSA provides the first line of defence for proliferation of material in and out of Canada. As the security element at all entrance and exit points to the country, their ability to identify and stop materials entering and exiting the country becomes critical as their operational level elements identify potential issues to the tactical level enforcement elements.⁶⁴

Canadian Security Intelligence Service (CSIS): Given the issues of intelligence and the need for an accurate picture of the situation, CSIS is another influencing factor on the counter proliferation framework.⁶⁵ Influences placed on the system are likely to be identified by CSIS as are the effects of that influence. CSIS is a key feedback element with respect to how the system is reacting.

⁶⁴ Canadian Border Service Agency, *2012–13 Report on Plans and Priorities*, (Canada, 2012), 8.

⁶⁵ Canadian Security Intelligence Service, “Backgrounder, Proliferation Issues,” last accessed 15 April 2014, <https://www.csis-scrs.gc.ca/nwsrm/bckgrndrs/bckgrndr07-eng.asp>.

Global Partnership Program (GPP): The GPP is a DFATD run program which aims to eliminate the proliferation of WMD and increase the security on global CBRNE stockpiles.⁶⁶ This program is a key element of Canada's counter proliferation efforts and has an influence on the problem space as a means by which effects can be achieved.

The Federal Emergency Response Plan (FERP): The FERP was produced by Public Safety and outlines the key mechanisms to ensure a WOG response to a situation. The document is focused on post event measures, with little mention of prevention. This document further highlights that at the operational level, the GoC is focused on response more so than prevention.⁶⁷ It is important to the problem space as it informs the actions that the GoC is considering for an event.

⁶⁶ Department of Foreign Affairs, Trade and Development Canada, "Global Partnership Program, " last accessed 10 October 2013, http://www.international.gc.ca/gpp-ppm/global_partnership-partenariat_mondial.aspx.

⁶⁷ Public Safety Canada, "Federal Emergency Response Plan," (Canada, 2011).

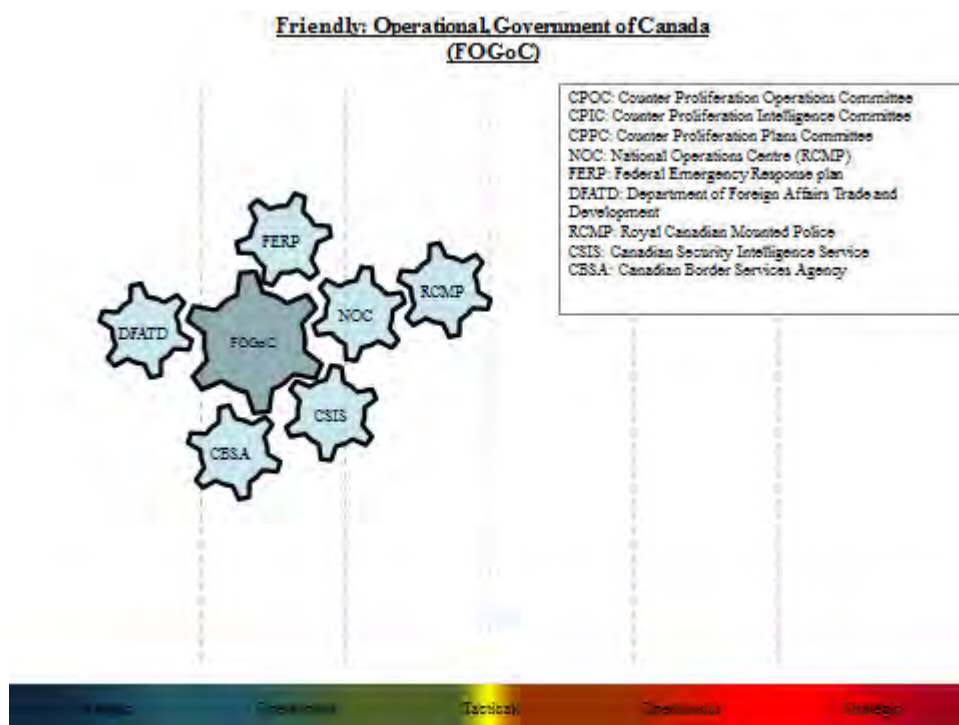


Figure 9: Friendly, Operational, Government of Canada

Friendly: Operational Canadian Armed Forces

Canadian Joint Operations Command (CJOC): CJOC is the primary force employer for the CAF with the Royal Canadian Navy, Canadian Army (CA), Royal Canadian Air Force (RCAF) and Canadian Special Operations Forces Command (CANSOFCOM) contributing forces as required to conduct operations.⁶⁸ As the primary force employer (CANSOFCOM can act as a force employer under certain conditions), CJOC has a key role to play in counter proliferation as actual activities and use of CAF resources must be coordinated through this command.

⁶⁸ Department of National Defence, “How we conduct operations,” last accessed 20 April 2014, <http://www.forces.gc.ca/en/operations-how/index.page?>

Canadian Special Operations Forces Command (CANSOFCOM): CANSOFCOM is the operational level headquarters for the Canadian Special Operations Forces. Given the nature of SOF, CANSOFCOM tends to interact at the high operational level to low strategic level for their engagements.⁶⁹ CANSOFCOM is tasked as part of their mandate with the conduct of counter proliferation activities⁷⁰ requiring CANSOF HQ to coordinate the actions of the tactical elements. Given the strategic importance of proliferation activities and the possible counter terrorism nexus to these events, CANSOFCOM is likely to find itself as a key node within the counter proliferation field at the operational level.

⁶⁹ Canada, Department of National Defence, “Canadian Special Operations Forces Command,” last accessed 20 April 2014, <http://www.forces.gc.ca/en/operations-special-forces/index.page?>.

⁷⁰ Ibid.

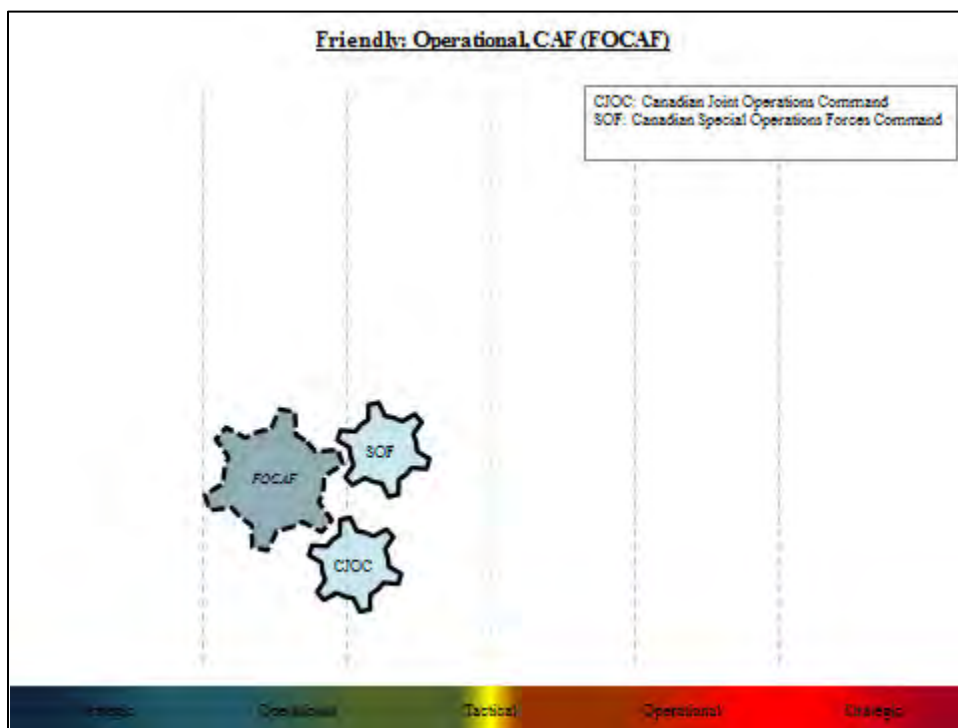


Figure 10: Friendly, Operational, Canadian Armed Forces

Friendly: Operational Conclusion

While the strategic level framed a number of laws and treaties influencing the problem space, we see the operational level adds in numerous agencies that have responsibility to manage the tactical aspects of counter proliferation activities. The existence of the operational level is often questioned, but in this case, we can identify organisations which clearly fall into the operational or middle management realm. Placing the various portions of the operational level together, we begin to see the complexities of counter proliferation activities with respect to the number of departments that are involved and influencing the problem space. It is important to note that what may seem like an excellent operational choice may in fact be opposing the operational

intentions or activities of friendly organisations. This requires an increased level of situational awareness across the WoG response.

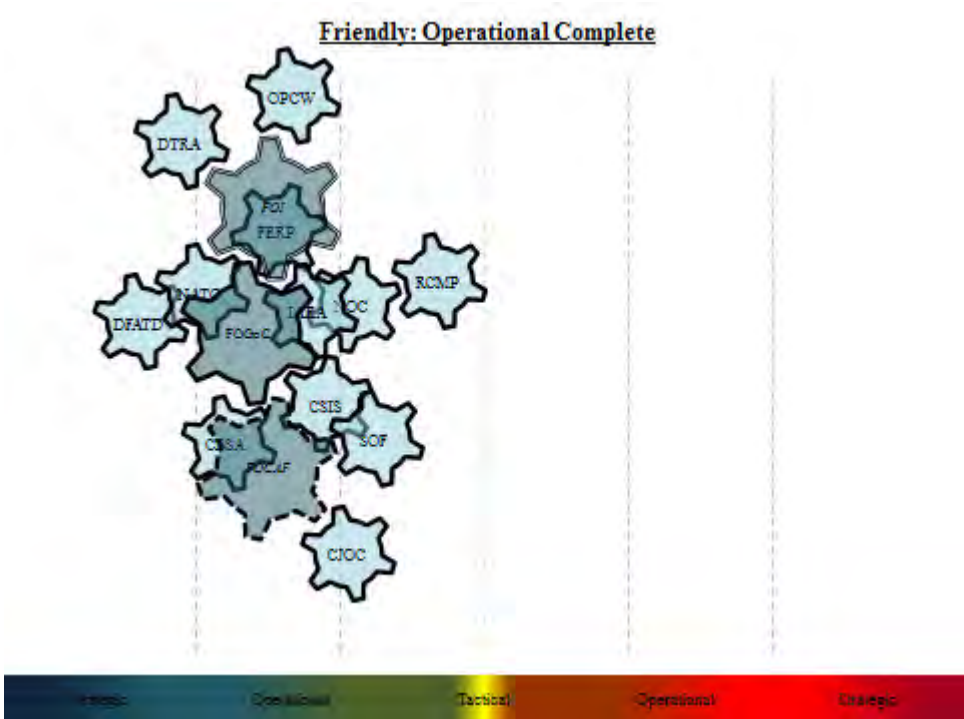


Figure 11: Friendly, Operational, Complete

Friendly: Tactical Level

Tactical doctrine applies the principles of operational doctrine when disposing naval, land, aerospace and special operations forces in actual contact with the enemy. The tactical level is concerned with planning and directing military resources in battles, engagements and/or activities within a sequence of major operations to achieve

operational objectives.⁷¹ Applied across the whole of government,⁷¹ we see the tactical level as the point where effects are brought to bear upon the problem space. The tactical level shall be discussed in very broad terms as opposed to specific capabilities as this is seen as sufficient for demonstrating their possible influence.

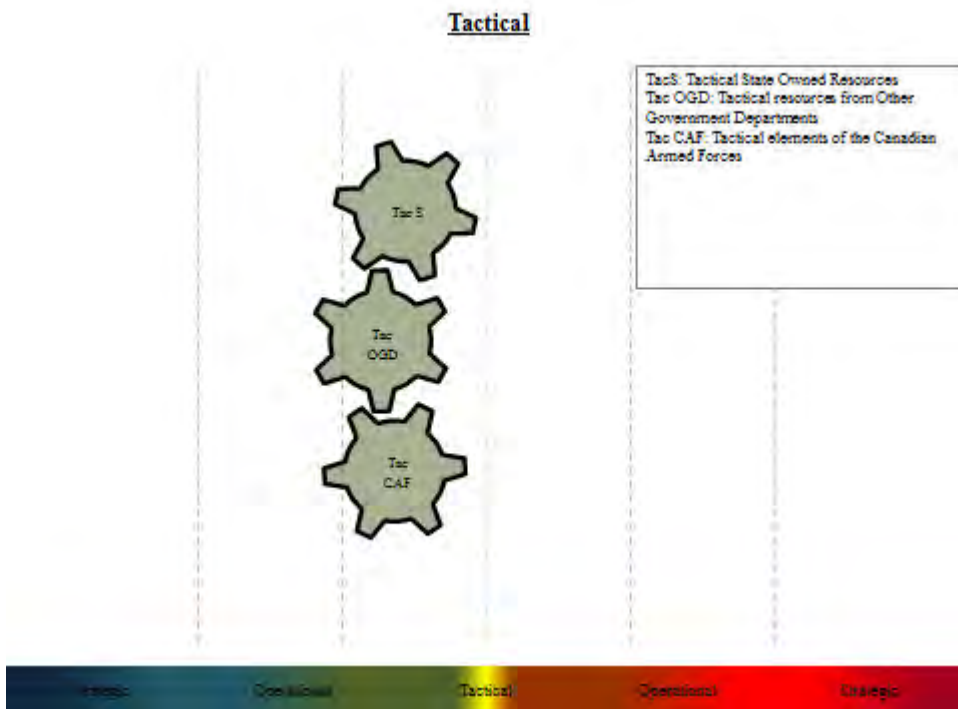


Figure 12: Friendly, Tactical

Friendly: Tactical Partners

Intelligence: Partner organisations may employ a number of intelligence collection assets. Good intelligence enables the system through a better understanding of

⁷¹ CFJP 01..., 1-3.

the proliferators operating environment.⁷² However, as the proliferators make efforts to shield their activities from allied intelligence it is important to understand the limits of the intelligence community. Understanding these limits provides insight into how the enemy system of gears is perceived, shaping allied actions.⁷³

Special Operations Forces (SOF): Special Operations Forces are often directly tasked in support of counter proliferation missions as the missions tend to be time sensitive, politically sensitive and require unorthodox and unique methods to accomplish.⁷⁴ Based on these requirements, countries such as the US have tasked their SOF elements as a key gear within their tactical counter proliferation efforts.⁷⁵ Given the unique nature of SOF operations, understanding the culture and methods of these organisations is an important factor in enabling allied counter proliferation efforts.

NATO Joint Combined CBRN Response Force: A subset of the NATO Response Force, the NATO CBRN Response Force is a standing task which is manned by various countries on a voluntary basis as part of their NATO contribution. The purpose of the

⁷² Craig H. Allen, "The limits of Intelligence in Maritime Counter proliferation Operations," *Naval War College Review*, Vol 60, No 1 (Winter 2007): 41.

⁷³ Allen, "The limits of Intelligence,"... 44.

⁷⁴ Harold L Bakken (Lieutenant-Colonel), "Special Operations Forces and Counter proliferation, the interagency process at work," (US Army War College, Carlisle Barracks PA, 1996), 9.

⁷⁵ Bakken, "SOF and CP"... , 4.

force is to provide a CBRNE capability to any NATO force tasked with a mission.⁷⁶ The force is predominately tasked with defensive measures and identification in support of major operations.

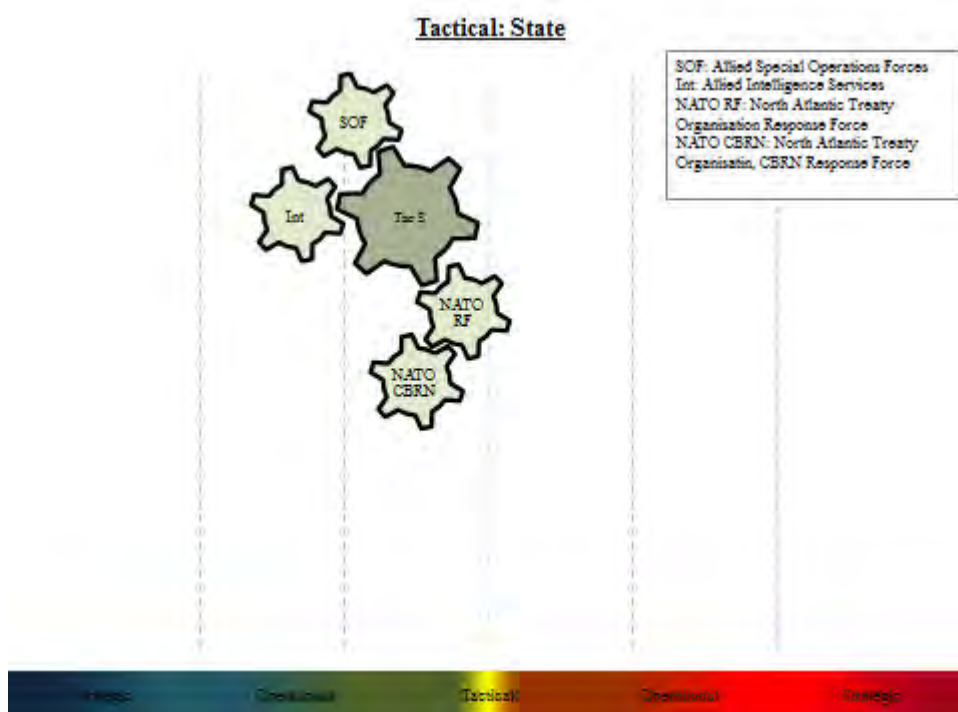


Figure 13: Friendly, Tactical, State

Friendly: Tactical Government of Canada

CSIS: At the tactical level, CSIS may be involved in the collection of information on possible proliferation threats. Their primary role is that of an investigative element in order to further define the proliferation threat.⁷⁷

⁷⁶ North Atlantic Treaty Organisation, “Joint Combined CBRN Response Force,” last accessed 15 December 2013, http://www.nato.int/cps/en/natolive/topics_49156.htm.

RCMP: The RCMP has a critical role to play in counter proliferation efforts as they will be the lead agency for law enforcement action taken to stop the threat. They will perform as part of the intelligence system building the picture on the proliferation network themselves and possibly through information sharing activities with other police forces.⁷⁸ With respect to counter the activities, the RCMP is the lead agency for the National CBRNE Response Team (Nat CBRNE RT).⁷⁹ The RCMP will take a lead role in the interception of a threat to Canada within their capabilities and capacities and will be the lead for the attribution of the activity and follow on activities

Canadian Border Service Agency (CBSA): CBSA has a primary role with respect to counter proliferation activities tactically as they are responsible for the movement of all materials entering and exiting the country.⁸⁰ Their ability to intercept items hinders the proliferators' efforts and helps to build the intelligence picture. This first line of defence acts as a deterrent to proliferation activities.

Financial Tracking: FinTrac is another organisation within the GOC which helps to develop the overall intelligence picture on proliferation networks. With respect to

⁷⁷ Canadian Security Intelligence Service, "The CSIS Mandate," last accessed 11 October 2014, <https://www.csis-scrs.gc.ca/nwsrm/bckgrndrs/bckgrndr01-eng.asp>.

⁷⁸ Royal Canadian Mounted Police, "Counter-Proliferation of Controlled Goods and Technology," last accessed 21 March 2014, <http://www.rcmp-grc.gc.ca/ce-da/cp/index-eng.htm>.

⁷⁹ Royal Canadian Mounted Police, "CBRNE," last accessed 21 March 2014, <http://www.rcmp-grc.gc.ca/fsis-ssji/fis-sij/cbrne-eng.htm>.

⁸⁰ Canadian Border Services Agency, "Backgrounder," last accessed 11 October 2013, <http://www.cbsa-asfc.gc.ca/agency-agence/who-qui-eng.html>.

Fintrac specifically, they have the means and resources to build an understanding of the movement of money and funds between organisations, providing a monetary link between entities.⁸¹ Given the nature of some CBNRE activities, large sums of money may be involved which would need to be moved so that the correct proliferators are paid off. Following this network helps build the intelligence picture.

Scientific Community: The role of the scientific community in countering proliferation efforts cannot be understated, specifically in Canada. The nation has leading edge scientist who are capable of assisting in better understanding the situation and can conduct forensic level analysis on CBRNE agents, helping to build the intelligence picture. Specifically in Canada, Environment Canada (EC) is highly skilled in the analysis and handling of chemical agents and compounds to include their identification.⁸² The Federal Radiological Assessment Team (FRAT) is a multi-government department who's role is to assess, categorise and mitigate radiological threats.⁸³ Finally, the Public Health Agency of Canada (PHAC) is a key member of the Nat CBRNE RT and a world leader in the handling and identification of biological agents. As these are at times the most complicated agents to deal with, their scientific abilities are a key enabler to counter proliferation activities.

⁸¹ Government of Canada Financial Tracking, "Who we are," last accessed 11 October 2013, <http://www.fintrac-canafe.gc.ca/fintrac-canafe/1-eng.asp>.

⁸² Environment Canada, "Identifying existing substances," last accessed 11 October 2013. <http://www.ec.gc.ca/ese-ees/>.

⁸³ Public Safety Canada, *Federal Nuclear Emergency Plan*, (Canada: Public Safety Canada, 1984).

First Responders: The final group of organisations to consider are the municipal and provincial level first responders which may respond to an event or be involved in an investigation prior to an event occurring. Care must be taken to properly enable these elements as they are the first line of defence in these matters and are in the closest proximity to events. Their ability to influence the problem space is limited to their specific area but amplified by their potential proximity to the issue.

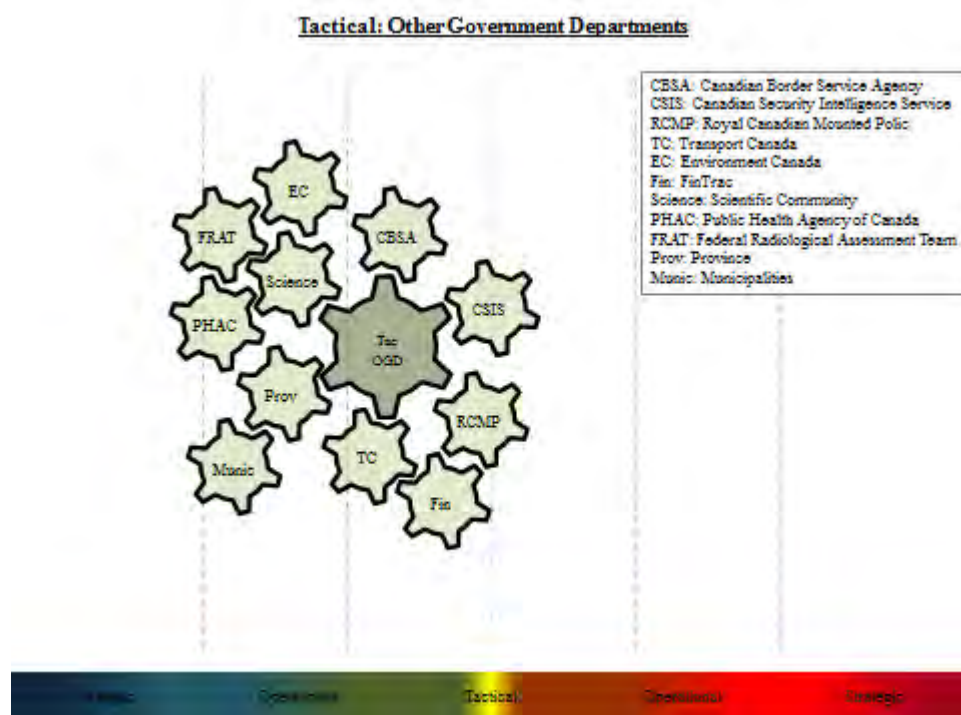


Figure 14: Friendly, Tactical, Other Government Departments

Friendly: Tactical Canadian Forces

Royal Canadian Navy (RCN), Royal Canadian Air Force (RCAF) and Canadian Army (CA): All services of the CAF are mandated to attain specific levels of proficiency

in CBRNE operations dependant on their level of readiness and tasking.⁸⁴ Separate of this each element brings with it a number of specialties and capabilities ranging from force projection over sea, land and air, to surveillance and sustainment in these environments. Finally, each element is capable of bringing kinetic and non-kinetic effects onto a target dependant on mission. Understanding what tactical elements are available as well as their specific capabilities influences the problem space in terms of the actual effects brought to bear on the event. It is important to note that these elements are employed through CJOC on operations. Knowledge of these ensures that the correct element is applied to the problem space in the appropriate manner. Lack of knowledge on the specifics of each element and their capabilities may lead to friction within the friendly system when the correct effect is not achieved.

Canadian Special Operations Forces Command (CANSOFCOM): CANSOFCOM accomplishes tasks through a number of standing Task Forces, each made up of an appropriate mix of capabilities from across the command. CANSOFCOM is a key component in counter proliferation activities and likely the most capable element in the CAF for these activities. The TFs are maintained on high readiness capable of responding to an emerging threat. Given the nature of CBNRE, the TFs are capable on calling upon elements from the Canadian Joint Incident Response Unit (CJIRU) which maintains a high level of CBRNE knowledge with respect to decontamination, identification and

⁸⁴ Department of National Defence, B-GL-005-380/FP-001, *Canadian Forces Joint Publication 3-8, Chemical, Biological, Radiological and Nuclear Defence*. (Ottawa: DND Canada, 2012), 0403.

detection as well as the requisite command and control elements. Finally, CANSOFCOM is positioned and mandated as an organisation to conduct tactical operations with strategic effect.

Defence Research and Development Canada (DRDC): The various DRDCs, specifically DRDC Suffield have levels of CBRNE knowledge which can assist at the tactical level. DRDC-Suffield has the ability to handle live chemical agents and is key to developing tactical level procedures for use in the field. Additionally, the labs in DRDC-Suffield and DRDC-Ottawa are skilled in the identification of CBRNE warfare agents.

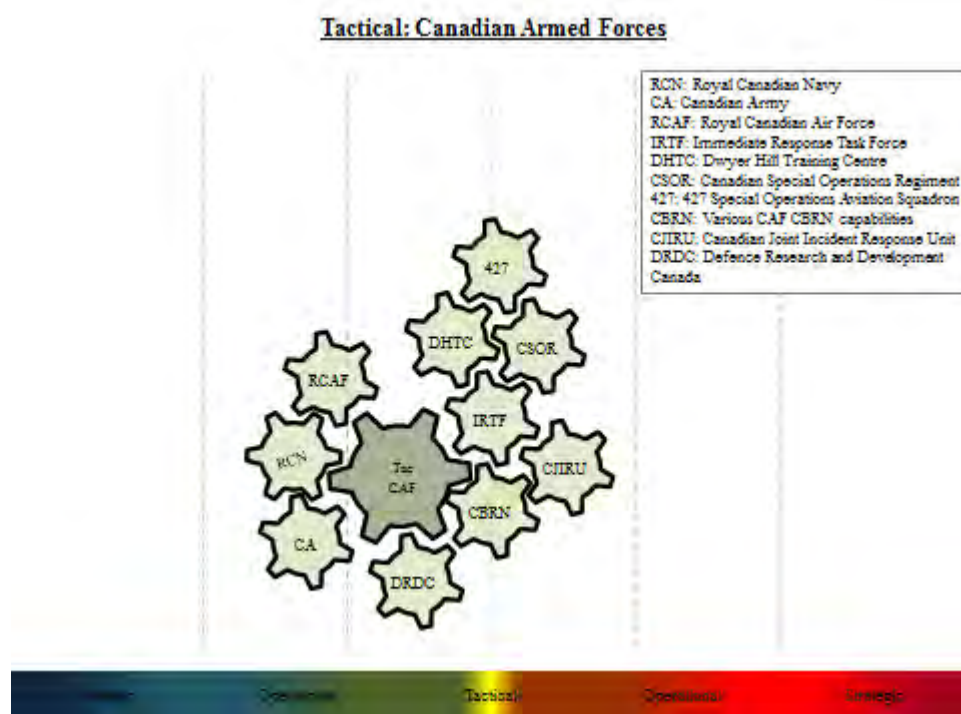


Figure 15: Friendly, Tactical, Canadian Armed Forces

Friendly: Tactical Conclusion

At the tactical level we begin to fully understand the sheer complexity of the problem as multiple organisations must conduct operations to influence the event gear. The interaction between these tactical gears is influenced by the operational and strategic levels, but unlike in a conventional military operation where the interaction between elements such as maritime, land, air and SOF assets is well defined, the interactions tend to be more complicated and less rigid in nature. Using the PSC model of prevent, prepare, respond and recover⁸⁵ we see that not all gears are present in the problem space at all times with specific element entering and exiting as appropriate to their mandate and capabilities.

⁸⁵ Government of Canada, *CBRNE Strategy...*,3.

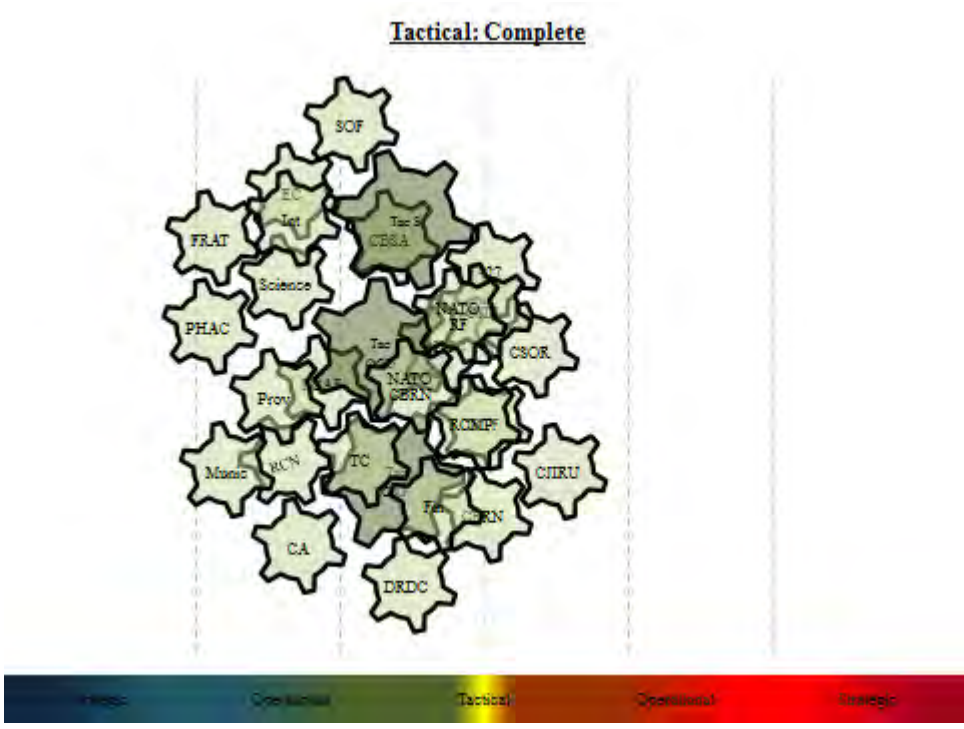


Figure 16: Friendly, Tactical, Complete

The Friendly Model

Overlaying all of the gears within the friendly model we begin to see the difficulty in understanding the problem space and that actions by any one organisation may not translate as expected throughout the system. Additionally, what may appear to be counterproductive and obstructionist activities by friendly organisations may in fact be completely reasonable given their understanding of the problem space. Understanding all of the second, third and fourth order effects of an action may not be possible and is in fact unlikely as the problem evolves. Knowing all of the effect however is less important than knowing and understanding how and where the effects may take. In this way, when

analysing the friendly model, knowing what questions to ask and where to look proves to be more important than building a complete picture of the friendly.

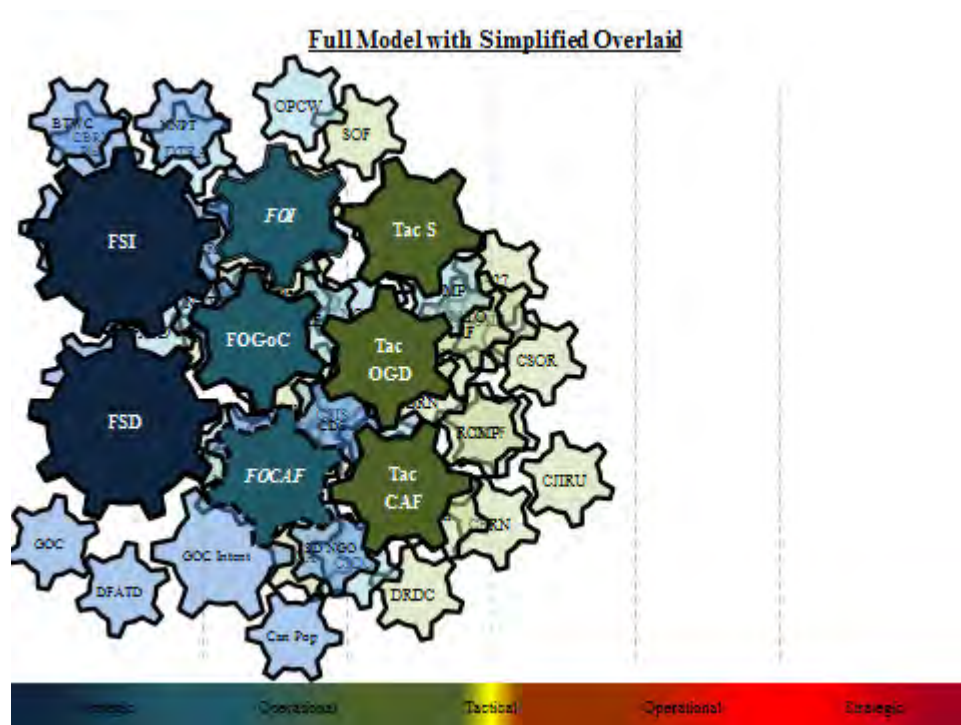


Figure 17: Friendly, Complete Model, with simplification overlaid

The Enemy Model

The difficulty with building the enemy or proliferator model is that they are likely to take measures to mask their activities so that counter proliferation efforts are not brought to bear. Whereas critical gears within the friendly model may be missed due to oversight, critical elements within the enemy model may be missed due to actions to hide their efforts. With this, it is than important to determine what questions need to be asked in order to properly build the enemy model.

The enemy model as depicted here shall be in accordance with CAF doctrine in that a strategic, operational and tactical level shall be explored as well as the interactions between the levels. The model shall be generalised so that it may be applicable to single actor as seen in the Amerithrax letters case, to larger organisation with grander aspirations such as Al Qaeda. The model is based on the proliferation network model presented by Mr Chris Hough during the Director of CBRN Defence annual working group in September of 2010.⁸⁶ Within the interplay of gears consideration shall be given that some organisations may pass on information in a linear manner from the strategic through the operational to the tactical while others may have all levels influencing each other simultaneously.

⁸⁶ Chris Hough, "Counter Proliferatin Networks," (lecture, Director CBRN Defence Working Group, Ottawa, ON, September 2010).

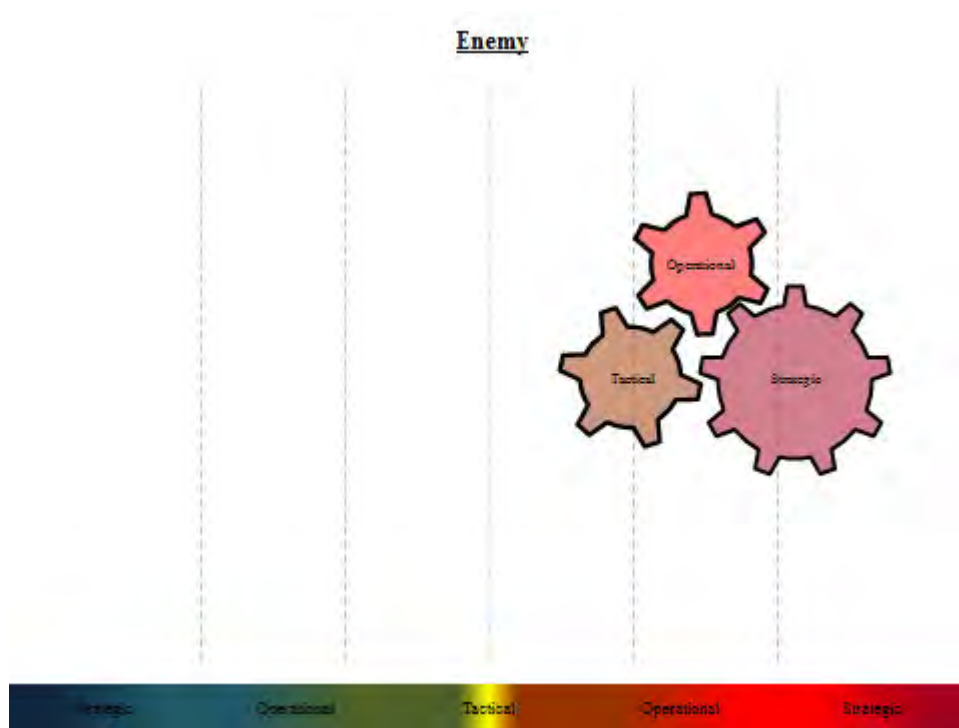


Figure 18: Enemy Model

Enemy: Strategic

Similar to the strategic level for the friendly forces, the enemy strategic level provides the “why” and “desired ends” to the proliferators’ effort and their desire to obtain a CBRNE device. This can be broken into the motivation to attack and the subsequent vision for the form the attack should take. In this, the strategic level answers why the attack should take place as well as framing some of the how.

Motivation: A crucial factor in the proliferation of CBRNE is the motivation to obtain the weapon. Terrorist motivation can take any number of forms but the Canadian legal definition states that the act is taken for political, religious or ideological

purposes.⁸⁷ Identifying the motivation for the attack is a critical component in understanding the organisation that plans to execute the attack and the methods that they may choose to use. The second key aspect to motivation is the removal of any impediments to executing the attack and making use of CBRNE materials. This is accomplished by the strategic leadership of the organisations as they engage at the strategic level to justify the use of these extreme means.⁸⁸ In large and complicated organisations this may be a formal process of orders and directives in various forms, while in the case of a lone wolf the member will create their own self-justification for the use of CBRNE materials to further their aims.

Vision: Concurrent to the motivation to execute a CBRNE event is the vision of what that event should achieve. Al Qaeda, Aum Shin Rkyio or the lone actor must all consider what their intended goal is and their overall objective. These goals and objectives drive the type of weapons being sought.⁸⁹ In some cases, the most readily available or easy to obtain material is seen as sufficient for the task⁹⁰ while other organisations may be seeking a specific weapon to achieve a specific aim (such as Al

⁸⁷ Department of Justice, "Criminal Code of Canada - Section 83.01 Terrorism", last accessed on 2 May 2013, <http://laws-lois.justice.gc.ca/eng/acts/c-46/page-28.html>.

⁸⁸ McComb, "Closing Pandora's Box"..., 79.

⁸⁹ Reshmi Kazi, "The Correlation between Non-State Actors and Weapons of Mass Destruction," *Connections: The Quarterly Journal* 10, no. 4 (Fall, 2011): 2.

⁹⁰ Seto, "The Sarin Gas Attack in Japan,".., 14.

Qaeda's goal of obtaining a nuclear weapon).⁹¹ For most terrorist organisations, the vision is based on causing terror and dread, as both of these conditions create instability making it easier to create change, as stable systems do not change easily.⁹² In other cases we see an intentional desire to create second and third order effects such as Aum Shinrkyio as the goal of the subway attack was not targeted at the riders riding the subway, but to affect the police investigation into the organisations efforts by disrupting their activities.⁹³

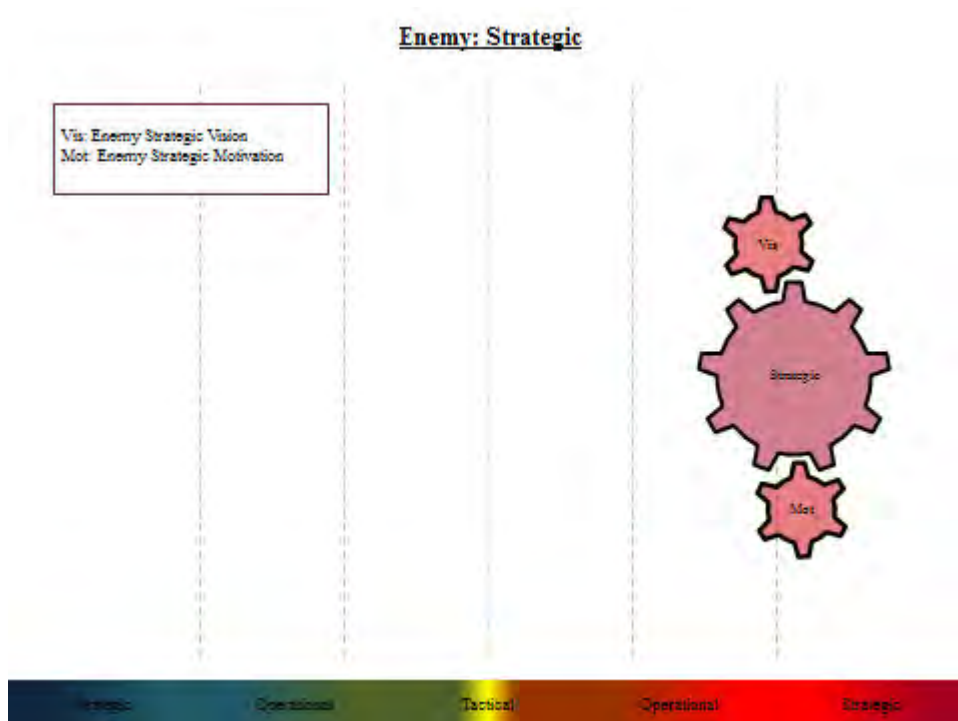


Figure 19: Enemy, Strategic

⁹¹ Mowatt-Larssen, "Al Qaeda Weapons of Mass Destruction"..., 3.

⁹² McComb, "Closing Pandora's Box,"..., 80.

⁹³ Seto, "The Sarin Gas Attack in Japan,"..., 15.

Understanding the enemy strategic level is critical to understanding the enemy as it provides insight into their motivation and vision. The motivation frames the problem in terms of the rules and regulations governing the enemy actions. This governance is unlikely to be similar to the friendly governance structure so understanding it becomes critical. The vision provides the guidance towards specific weapons types and specific effects. The vision is also critical in that it drives the event in terms of the second and third order effects that are desired by an attack.

Enemy: Operational

Within the enemy model the operational level focuses on obtaining the means by which an attack can be executed.⁹⁴ Within the operational level we begin to see a further exploration of how the attack is to be conducted as well as adding in the by who and with what aspects of the event.

Funds: The first aspect of the operational level is the collection of funding for the group. It could be postulated that sufficiently motivated the members of the group may not require financial incentive, but the group will need basics such as food and shelter. Also, funds help with the acquisition of the device and enable the recruiting, training and radicalising of new personnel. Proper funding in turn enables a better trained and equipped organisation more capable of obtaining CBNRE weapons. The methods of obtaining funding are varied for terrorist organisations and span the list of illegal

⁹⁴ Kazi, "The Correlation between Non-State Actors and WMD," ..., 7.

activities as well as donations from sympathisers. This gear is a key source of power for the enemy system.

Device: There are two methods of obtaining a CBRNE device for the execution of an attack. The first is to make use of funds, theft or donation by a sympathetic group to obtain a completed and functioning device. The acquisition of a completed device may prove highly difficult however interfering with the goals of the proliferator. The second is to build a device. Building a device requires both knowledge and materials. As per the friendly strategic model, we see that the control of the materials related to CBRNE devices is highly controlled through various treaties making acquisition difficult. Once the materials are obtained, there is a certain level of knowledge required to properly construct the devices. The level of knowledge required is varied, but at the extreme destructive end of the spectrum, studies have concluded that three post-doctoral personnel are capable of designing a crude nuclear device.⁹⁵

People: The execution of a CBRNE attack will require people to carry out the event. Creating the cadre of personnel to build the device as well as execute the attack requires three factors, recruitment followed up with training and radicalisation.⁹⁶ The recruitment methods can be focused on key skill sets or on general personnel. When looking for specific skill sets such as scientists, the task is made more difficult while

⁹⁵ Kazi, "The Correlation between Non-State Actors and WMD," ..., 4.

⁹⁶ Paul Collier "Economic Causes of Conflict and Their implications for Policy," In *Leashing the Dogs of War: Conflict Management in a Divided World*, edited by Chester A Crocker, Fen Osler Hampson and Pamela Aall, 197-217 (Washington, DC: United States Institute of Peace Press, 2007), 217.

general labourers may be easier to obtain. Once the appropriate personnel are located, it may be necessary to radicalise them towards the cause so that they will use their skills to proliferate the weapon and execute the attack. This may include influence from the strategic level to motivate the members as to why a CBRNE device is an acceptable method of attack. Finally, it may be necessary to train the personnel in specific terrorist tactics or techniques. All of this will take effort but is necessary in the execution of an attack.

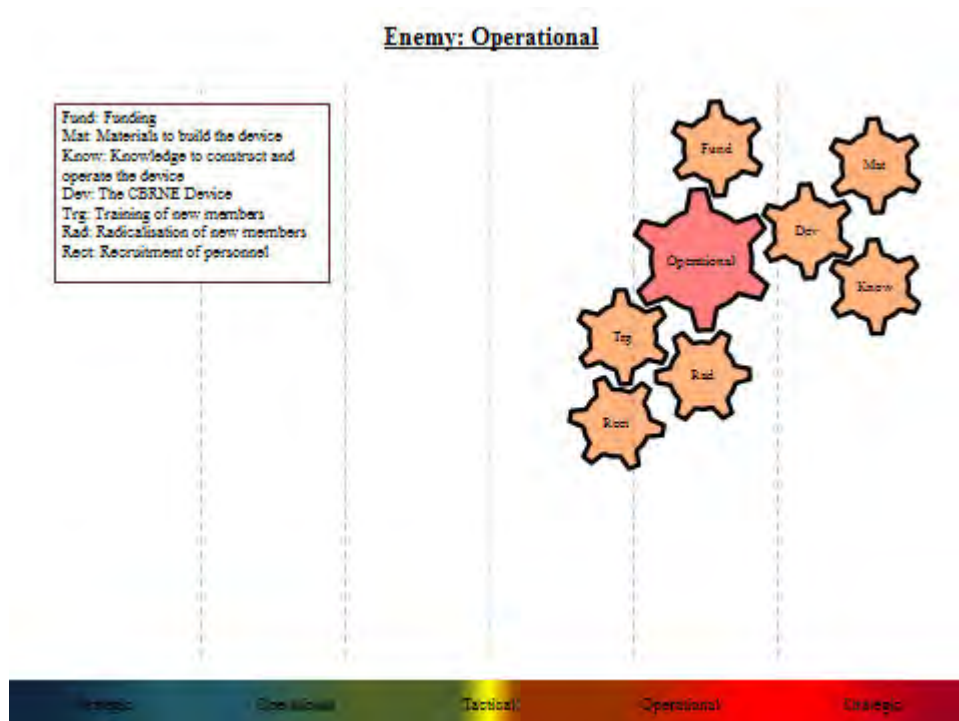


Figure 20: Enemy, Operational

Enemy: Tactical

Cells: The enemy tactical level is based on any number of cells or units with specific objectives and goals in support of the overall vision. The interaction between cells may be highly organised or completely disjointed. In general the loss of a single cell may not severely impede the entire network or may collapse their development. The cells themselves may be responsible for target selection, surveillance and execution of an attack. A single cell may have only one portion of the tasks or all of them depending on the complexity of the network. The cells themselves under direction from their superiors provide the when and where aspects of the event.

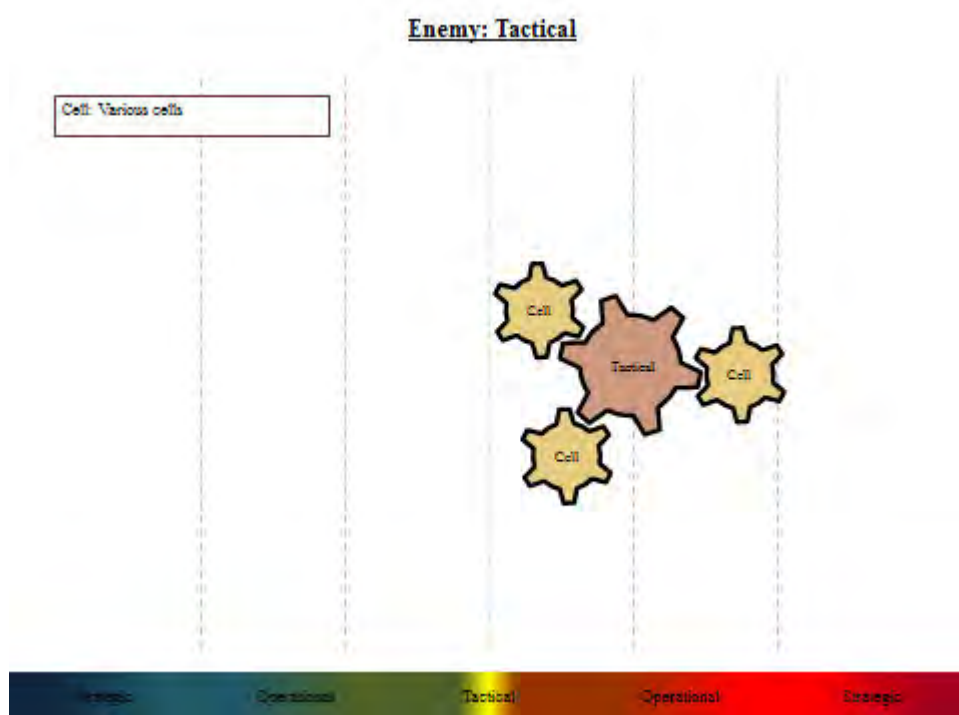


Figure 21: Enemy, Tactical

Enemy: In perspective

The enemy model as presented here is simplified in order to highlight just some of the activities that may have to take place in order for an organisation to proliferate a CBRNE threat for use. The various gears although necessary can be engaged and disengaged in the system as the enemy sees appropriate making it difficult to gain situational awareness. This lack of awareness enables the enemy efforts as counter proliferation efforts may not be brought to bear. This can be due to lack of information on where to appropriately exert influence (to include the appropriate type of influence) or in the worst case, lack of knowledge that the threat is manifesting. Proliferators are further enabled by their ability to manipulate the system as they see fit, mixing, skipping and adjusting the strategic, operational and tactical levels as they see appropriate. As such, the threat can evolve and adapt to counter proliferation efforts, leaving the system entirely if it is deemed too difficult or exerting exceptional pressure if an opportunity to create an event is presented. The evolving and changing nature of proliferation efforts has a significant effect on how counter proliferation efforts are planned.

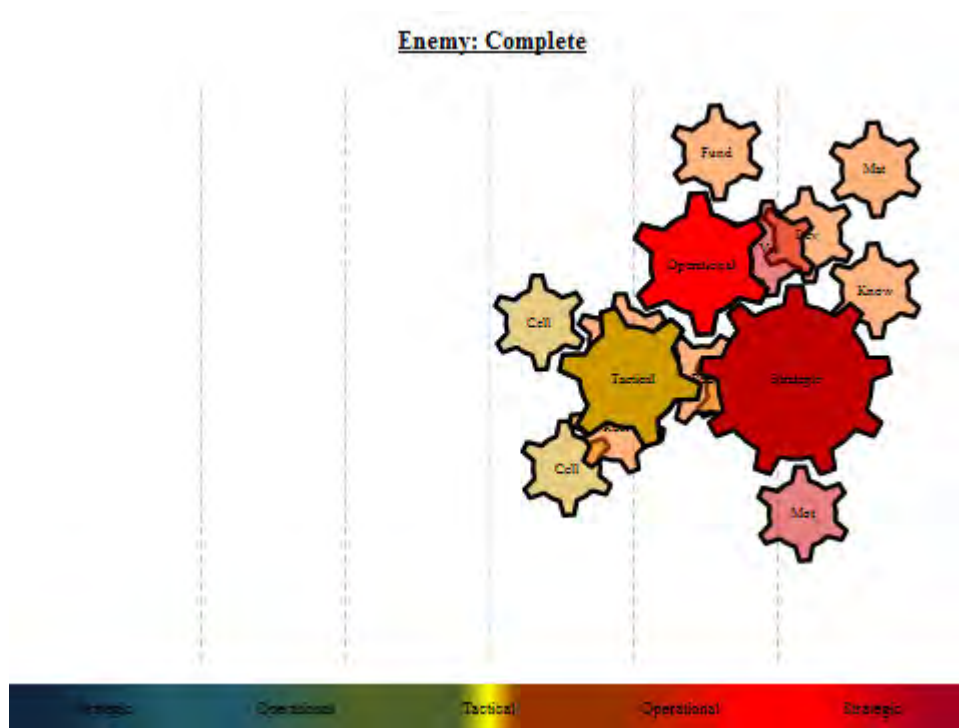


Figure 22: Enemy Model, Complete

Complete Model

As a model, what has been described thus far creates a visualisation of the problem space but has limitation in capturing all of the complexities of the system. With this model, we see the various forces trying to influence an event in time and space which would be the use of a CBRNE weapon against a population in order to create terror. Linking back to the original paradigm, we see that the counter proliferation efforts are trying to drive the system in a direction favourable to the friendly forces while the proliferators try to drive the event at a time and place of their choosing.

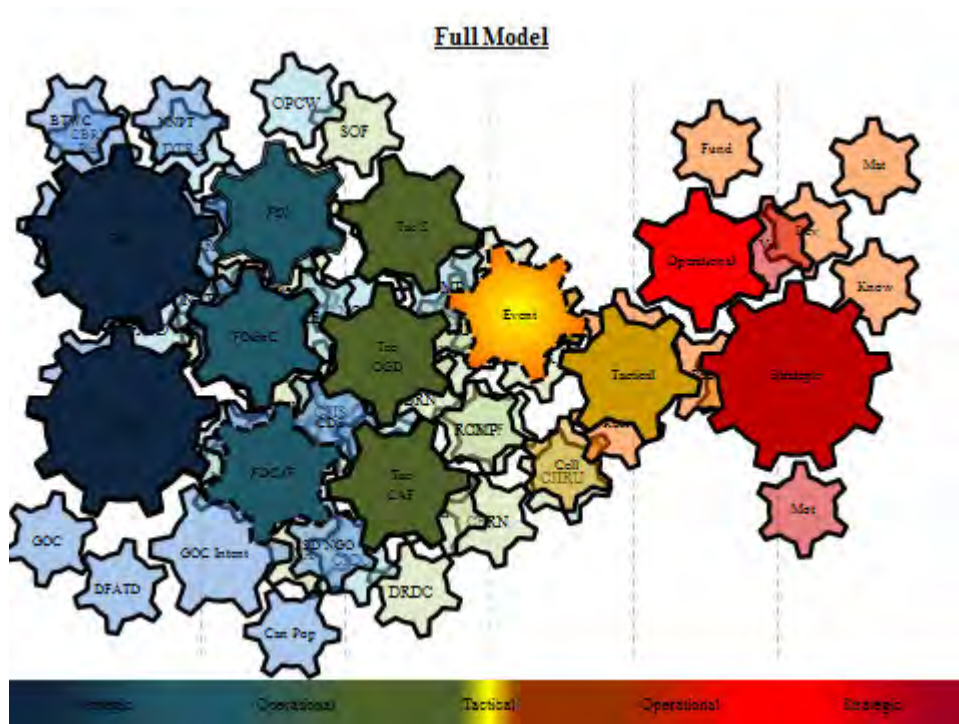


Figure 23: Complete Gear Model

This model can be simplified to just the major elements, acknowledging that each of the major elements has multiple sub elements and that the sub elements in fact can interact with each other and the enemy, possibly without going through their parents gears.

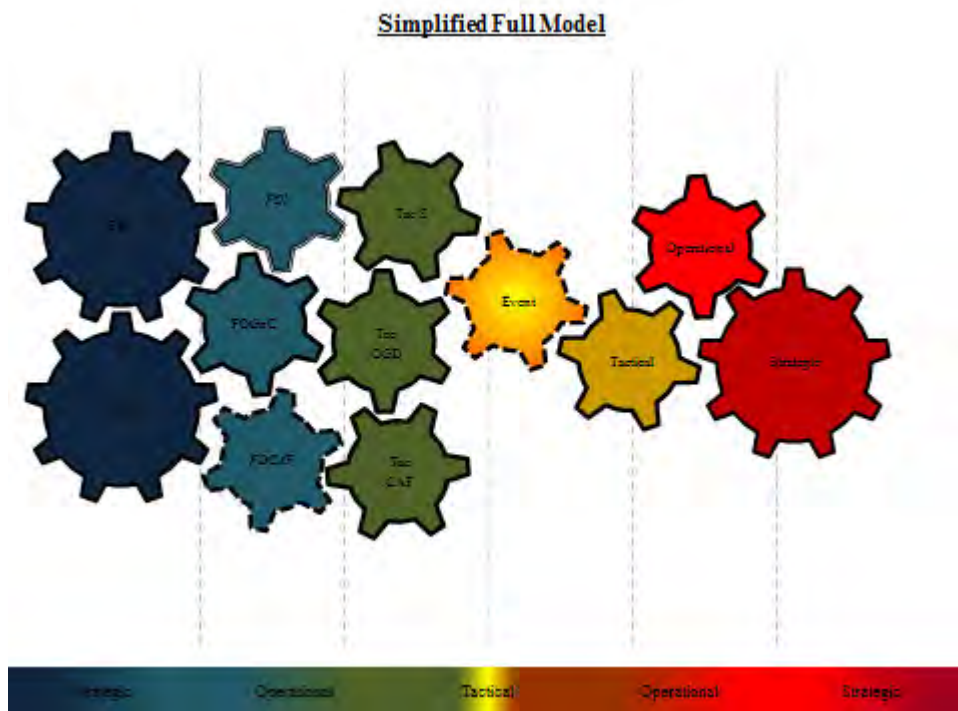
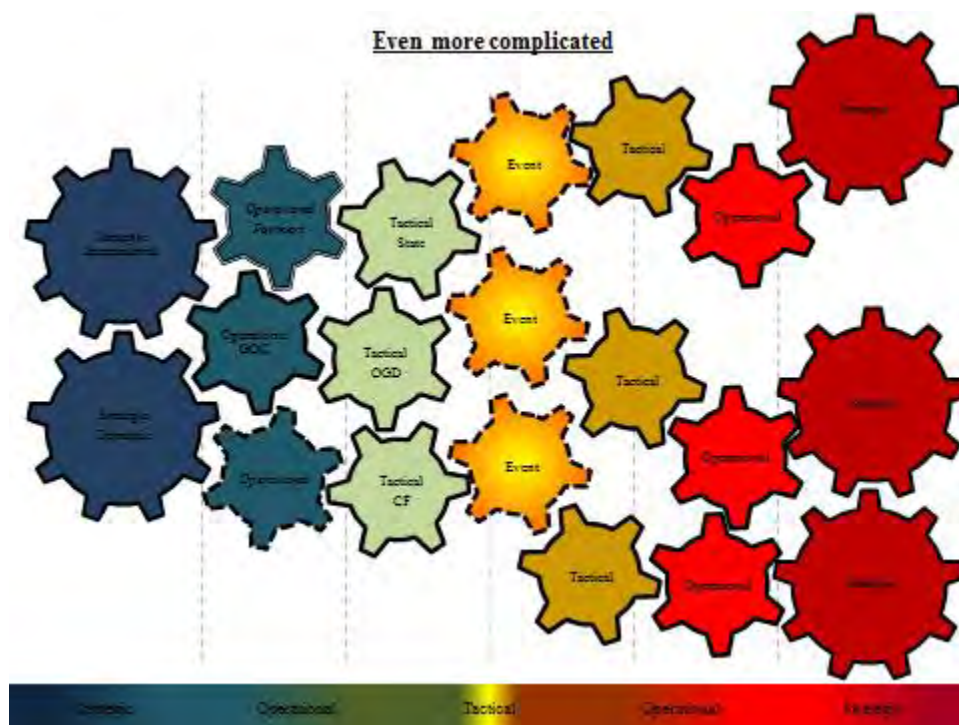


Figure 24: Complete Model, Simplified

Further complicating the model is that there may be multiple events from multiple proliferators being manifested at any given time. These events could be the work of individual terrorist organisations, terrorist organisations working in support of each other, or lone wolf type threats working towards an individual objective.



The Result of an attack

Using our simplified model of the problem space and acknowledging the layers below it, we can analyse where the effect of a successful attack is felt on the system. This effect is based on the idea that the aim of a terrorist organisation is to make use of CBRNE materials to exert political, religious or ideological influence on the system. In a conventional problem it is the tactical elements that are hit by an attack directly, thereby creating direct pressure on the system. However in this case, any time the enemy is able to overcome our ability to influence the event gear, the effects are felt in different places. This is often because the tactical elements are not the target of the attack although they are the ones most likely to be able to influence it.

Areas where the attack are likely to be felt include first and foremost the population which is itself an influence at the strategic level. Attack effects will also cause friction between the strategic and operational levels as the system looks to account for the event. Additionally, any tactical elements responding to the event are likely to be influenced and possibly degraded as a result of the attack. Finally, the attack may create friction and conflict between the strategic gears as Canada responds to the event and accounts for the actions that have taken place.

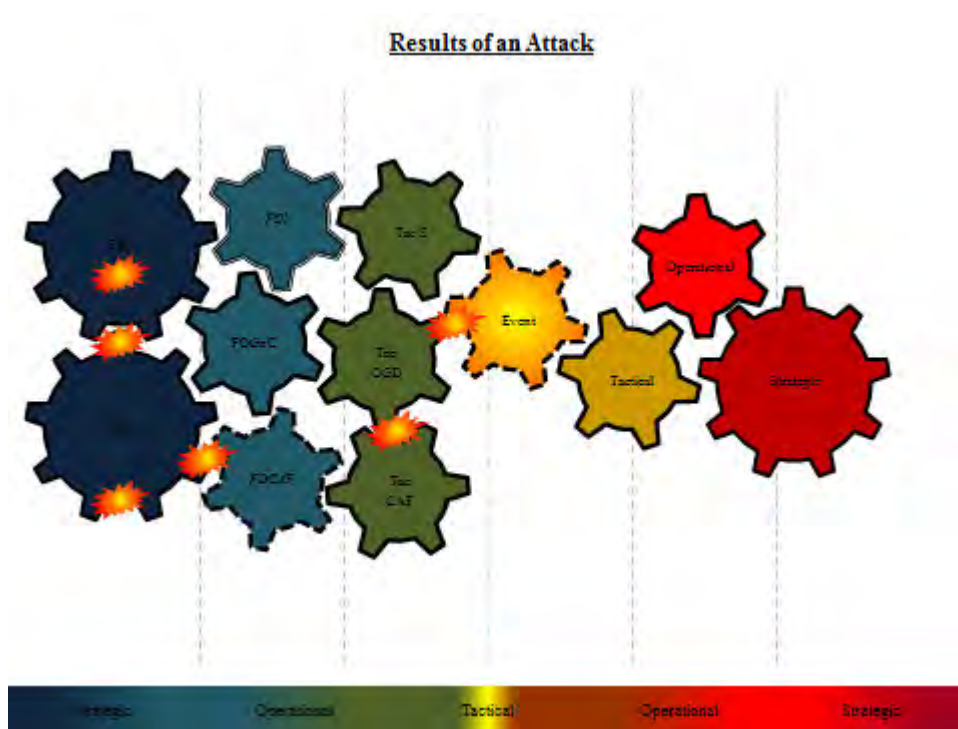


Figure 25: Result of attack on Model

Wicked Problems

Having spent so much effort in framing the problem space and building the narrative of gears, the problem space itself reveals itself to be volatile, uncertain, chaotic

and ambiguous.⁹⁷ Simple solutions to countering the proliferation problem may in fact be more damaging than the result of an attack by proliferators, thus the solution is worse than the problem.⁹⁸ Shutting down Canadian borders to movement of any type would address the issue of devices being proliferated in, out or through Canada, but would Canada survive the solution?

This leads to the concept of wicked problems. Wicked problems are considered difficult to tame because of their volatile, uncertain, chaotic and ambiguous nature.⁹⁹ Most commonly, wicked problems are defined by a series of 10 attributes. These attributes are compared to the counter proliferation problem space here:¹⁰⁰

-No definite formulation to the problem: As enemy forces enter and exit the system, changing and evolving their methods over time, we see it is not possible to fully define the issue of proliferation. Being unable to fully define the problem impairs our ability to define a solution.

-There are no stopping rules: When countering proliferation, there are no indicators or methods to determine when efforts have been successful and that

⁹⁷ Beckman, Sara L., and Michael Barry. 2012. "Teaching Students Problem Framing Skills with a Storytelling Metaphor," *International Journal Of Engineering Education* 28, no. 2: 364-373, Abstract.

⁹⁸ C. West Churchman, "Wicked Problems," *Management Science*, (December 1967), B-141.

⁹⁹ Ibid.

¹⁰⁰ Horst W. J. Rittel and Melvin M. Webber, "Dilemmas in a General Theory of Planning," *Policy Sciences*, (June 1973).

there are no further threats. A lack of events may infer success or may simply infer that portions of the enemy problem space remain unknown.

-There are no criteria for correctness: As we look at the counter proliferation problem, there are no existing criteria that define the correct and most effective approach to the problem. The number of tactical elements that can be applied to the problem space demonstrates the number of solutions possible.

-There are no immediate tests of the solution: The effects of any actions taken at the strategic, operational or tactical level will not be readily apparent as we are not fully cognisant of the entire enemy picture and may never know the results of friendly deterrent action on the proliferators. It may be some time before the effects of actions are realised.

-There is no final test of the solution: As counter proliferation is a deterrent, there is no way to determine if the methods in place are ultimately successful to stop proliferation or only temporarily so. This is compounded as a solution which is effective in the short term may not provide long term solutions as the proliferators evolve and adapt.

-Once a plan has been initiated the effects of the action cannot be stopped: We have the ability to control what influence we apply to the system but we may not be able to control the second and third order effects. As such, any counter

proliferation efforts must be weighed in strength as to the possible effect on the entire system.

-There are no lists of permissible actions: Simple and complex problems have finite options to solve the problem. Within counter proliferation we see all levels and all resources can be brought to influence the problem space in any number of ways.

-There are no well-defined solutions: The issue of counter proliferation is neither new nor fully understood resulting in ongoing research into the field. Although solutions are postulated, no final solution to the problem set has been proposed.

-Every wicked problem is unique: We see that the issue of counter proliferation may have some similarities to counter terrorism in terms of its complexity, but it is unique to other problems faced and solutions to any given scenario may not translate to even similar scenarios.

-The problem solver has no right to be wrong: In counter proliferation, being wrong can lead to tragedy and death. Those executing counter proliferation activities must be correct in their actions and cannot act in a manner so as to positively influence the proliferators.

The Problem Space Reviewed

The purpose of this chapter was to consider all of the factors influencing the problem space. This was done by representing the various physical¹⁰¹ and non-physical¹⁰² elements as a set of gears which can apply pressure and thereby influence the system. There are numerous other gears that are not represented in the system as only the major gears have been represented. It must be understood though that in practical application, even a seemingly minor gear unaccounted for here may create a significant effect. Understanding the interaction between the various gears is important in realising that what are seen to be correct actions by any singular organisation may in fact be counterproductive to other aspects of the system. What may appear to be positive influences from the friendly side by individual gears may in fact be detrimental to the system as a whole causing inefficiency and frustration.

Having reviewed the problem space we can then identify that the problem space itself represents a wicked problem. This is a type of problem which is unique in that the solution space must be adaptive to an evolving problem. Due to the adaptive nature of the requisite solution, it is necessary to review existing problem solving methodology to see if they are appropriate to the problem being presented.

¹⁰¹ The physical consists of organizations, committees and units.

¹⁰² The non-physical consists of treaties, agreements and laws.

CHAPTER 3: OPERATIONAL PLANNING FRAMEWORKS

Introduction

Significant effort to this point has been put forward in exposing the problem space and demonstrating that it is wicked in nature. This is important as an understanding of the problem space is necessary prior to considering what method shall be used to address the issue. Too often, the tools and methods available become the default even at times when not appropriate. Using the incorrect tool may work at times, but may also further complicate the issue. This analysis was therefore necessary to ensure that the problem solving methods are appropriate to the problem in need of solving.

This is further complicated as the CAF is unlikely to be the overall lead agency more likely working in a supporting role to another government department. This lack of a lead role does not absolve the CAF from their planning duties and all tasks must be fully considered prior to execution. However based on the nature of the problem, comprehending the non-linear cause and effect relationship is made more difficult. As such, understanding the influence that the CAF problem solving methods have in understanding the problem space leads to an understanding of how effective the methods are.

The applied method currently in use, the Operational Planning Process (OPP) shall be reviewed with an analysis of its limitations to demonstrate its weaknesses at addressing proliferation issues. Once the limitations of the OPP are explored, a review of

design theory as a method for addressing wicked problems such as counter proliferation shall be conducted. Other methods such as game theory were considered but have not been included as they do not aid in furthering the argument, but can be considered for follow on work.

Existing Paradigm, The Operational Planning Process (OPP)

As previously discussed, the OPP is a linear problem solving method designed to translate strategic direction into tactical tasks. This is done by analysing the problem space and identifying the opponent's centre of gravity.¹⁰³ Once an opponent's centre of gravity is determined, a campaign plan is constructed to attack it.¹⁰⁴ Translating this into the gear model we see this as efforts to influence the problem space event to the point where the enemy system breaks down. The breakdown does not always occur at the gear directly in contact with the event, as the centre of gravity may be at the tactical, operational or strategic levels. The result of a successful attack on the enemy centre of gravity should ensure that they are no longer capable of influencing the event space and as a result no longer provide a threat to the friendly space. The OPP process itself is based on a five stage model consisting of initiation, orientation, Course of Action (COA)

¹⁰³ DND, *CFJP 5-0...*, 2-3.

¹⁰⁴ John Anderson, "From Systemic Operational Design (SOD) to a Systemic Approach to Design and Planning: A Canadian Experience," *Canadian Military Journal* Vol 12, No 3. (Summer 2012): 38.

development, plan development and finally plan review.¹⁰⁵ This expands the operational level within the gear model to a five step procedure.

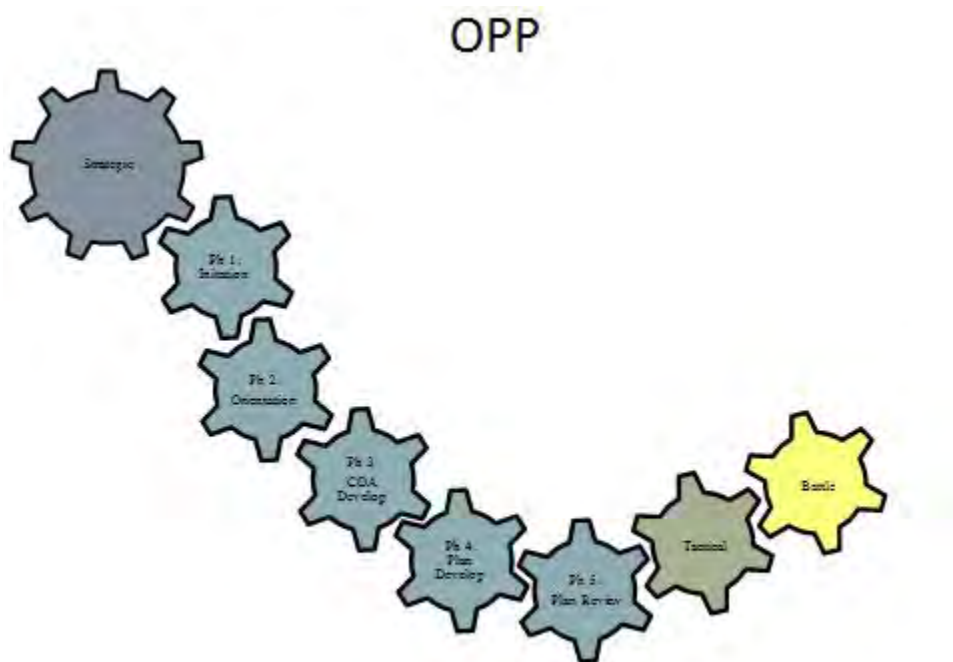


Figure 26: The Operational Planning Process

As a process the method is adequate for simple or complex problems, but fails to account for unexpected circumstances inherent in a wicked problem such as counter proliferation. This requires the process to be continually repeated as friendly actions can cause the problem space itself to change.¹⁰⁶ Thus the major limitations of the OPP in addressing counter proliferation problems are borne out of the number of steps in the

¹⁰⁵ DND, *CFJP 5-0...*, 3-9.

¹⁰⁶ Matthew Lauder, “Systemic Operational Design: Freeing Operational Planning from the Shackles of Linearity,” *Canadian Military Journal*, Vol 9, No 4 (2009): 43.

process, the linear nature of the steps, the failure to achieve a shared visualisation of the problem space and the inability of the method to address the complete issue.

First when OPP is applied to counter proliferation problems it is hindered by the number of steps¹⁰⁷ required in order to formulate a solution and that they must be followed in order.¹⁰⁸ In most cases this is simply an encumbrance and inconvenience where in counter proliferation this becomes a critical flaw. As a linear process, new direction and information can only be introduced at Stage 2: Orientation.¹⁰⁹ Assuming the second order effects are limited, a flexible planning team is capable of going back in the process and introducing the new elements and reviewing the conclusions affected by the change. A less skilled team however may be required to repeat the entire process as a result of the change.¹¹⁰ With counter proliferation the actions at the tactical level in enacting a solution affect the entire system both friendly and enemy, meaning that once action is taken, the nature of the problem itself changes.¹¹¹ Because tactical actions affect the nature of the problem, new guidance is often required as is revisiting the entire

¹⁰⁷ David J. Bryant, "Can we Streamline Operational Planning," *Canadian Military Journal* (Winter 2006-2007): 86.

¹⁰⁸ Bryant, "Can we Streamline"... , 84.

¹⁰⁹ DND, *CFJP 5-0...*, 4-4.

¹¹⁰ DND, *CFJP 5-0...*, 1-9

¹¹¹ Anderson, "From Systemic Operational Design (SOD)"..., 42.

process, making the process iterative in nature. This is not a fatal flaw in the process, but an indication that it is inefficient at handling wicked problems.¹¹²

This is further amplified as the OPP fails to achieve a shared visualisation of the problem space across all elements.¹¹³ This is not to be confused with the concepts of mission command¹¹⁴ which give subordinate elements flexibility to the manner in which they execute their tasks. This difference between the two is subtle but important. In mission command the tactical elements must know what the strategic intent is and ensure their missions are in support of this intent. In a shared visualisation, the tactical elements must know what the strategic intent is, but also why that intent exists and the results their actions on the proliferators will have in modifying the problem space thereby affecting the friendly strategic direction. In this case, knowing strategic intent is not enough, but a shared visualisation of what led to the strategic intent and what may affect it becomes important. Additionally, the actions of the CAF must be measured against the effect they have in reinforcing or displacing other friendly efforts. This requires a degree of time and effort into understanding the interactions amongst the various gears and their effects on the system, as well as the indirect and “emergent” effects that may play out across the system as a result actions taken.

¹¹² Lauder, “Systemic Operational Design,”..., 43.

¹¹³ Bryant, “Can we Streamline”..., 87.

¹¹⁴ CFJP 01..., 4-3.

Further complicating the issue is the need to develop multiple COAs to address the problem and then to test them against the enemy model.¹¹⁵ When the problem is limited to a single friendly and single enemy actor and when those actors only have two options, the problem space is limited. However, introducing another actor into the system such as a neutral entity or another enemy proliferator causes exponential growth in the number of results that must be considered. Using the expanded form of game theory we quickly see the added complications of simply having two friendly decision makers to consider vice one, taking our possible outcomes to consider from four to eight. Once again, this is not a critical flaw in the system, but the need to account for every possible decision of significance creates a greater degree of analysis requiring all combinations to be analysed. Playing out each combination may actually hurt the understanding of the problem as the planners as they develop a false sense of certainty in their analysis.¹¹⁶

¹¹⁵ Bryant, "Can we Streamline"..., 86.

¹¹⁶ Lauder, "Systemic Operational Design,"..., 43.

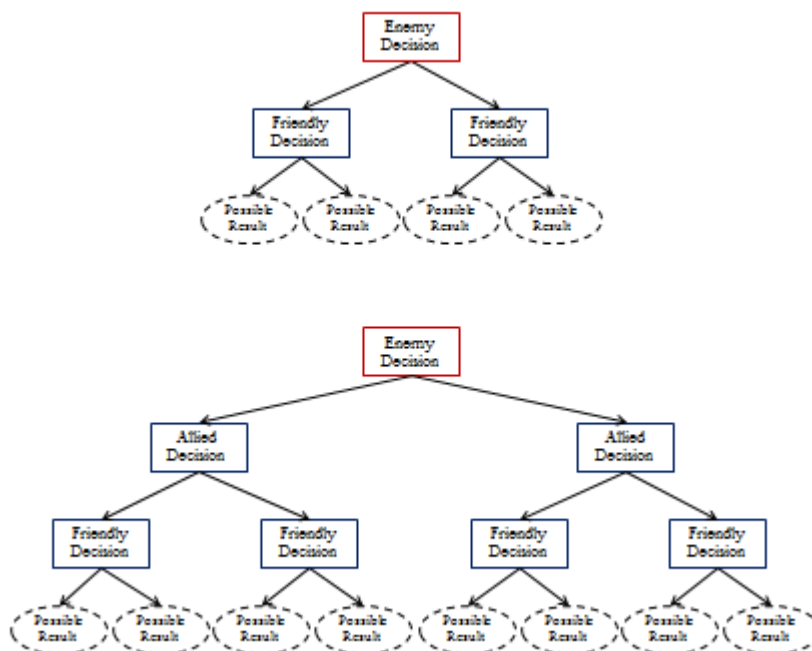


Figure 27: Increasing Outcomes with Increasing Actors

Proponents of the OPP may state that addressing all of the complexities of a problem is not necessary as long as the portions applying to the tactical elements under command are understood. When looking at wicked problems however, the idea of only addressing one part the problem is considered a moral failure.¹¹⁷ Thus only addressing the portions of the problem directly under CAF influence is not appropriate to this problem set.

From this, we begin to understand that the OPP is too rigid a process, focused too heavily on finding a solution to the problem as opposed to understanding the dynamics of

¹¹⁷ Churchman, "Wicked Problems," B-142.

the problem space. For conventional military problems with a finite start and known desired end state and condition this is acceptable. However, for the issue of addressing long term and tightly connected issues such as counter proliferation, the method fails to achieve suitable results. The strategic influence and strategic impact of failure are too onerous to “just understand the CAF” part of the problem. A different mindset and problem solving method must be used in order to be successful.

The Social Sciences

Seeing that a linear process such as the OPP has difficulties addressing the complexities of a wicked problem¹¹⁸, it is therefore necessary to find a problem solving method which is capable of dealing with counter proliferation. Prior to this, it is necessary to identify at the fundamental theoretical level the concepts that the problem solving method must encompass. For this the social sciences are explored with considerable attention to the work of Bent Flyvbjerg. The social sciences have long been plagued by their inability to provide phronesis or practical wisdom, specifically ideas and concepts that can be used to predict behaviour and outcomes.¹¹⁹ In addressing this, efforts are being made to reinvestigate some of the limitations of the social sciences and concepts are being put forward that would allow for fuller comprehension of a problem

¹¹⁸ Consideration was given to explore other linear processes and analyse their effectiveness in addressing wicked problems and counter proliferation. However, the key issues inherent in linear processes remain. Therefore, no further analysis into linear problem solving methods was considered.

¹¹⁹ Bent Flyvbjerg, *Making Social Science Matter. Why social inquiry fails and how it can succeed again, 13th Printing*, translated by Steven Sampson (Cambridge UK: Cambridge University Press, 2011), 2.

space allowing for greater understanding of possible solutions. This enabling of the social sciences through new concepts has thus created opportunity in the development of new problem solving methods.

One of the keys to this phronesis is in having a higher level of knowledge of the problem prior to determining the solution. The goal is to look for the first order context or the root issues at play as opposed to the effects.¹²⁰ This leads to the concept of understanding the *game* as opposed to the *rules*.¹²¹ This is difficult as the rules are tangible and can be measured and quantified where the concept of the game is more abstract in nature. However, successfully understanding the game as opposed to just the rules which make it up allows for a higher level of learning to be achieved and a deeper understanding.¹²² By this a novice would know the conventions applicable to counter proliferation but apply them without appreciation of the context of the situation.¹²³ An advanced beginner would take the same rules and begin to apply them with some appreciation to their relevance to the situation being faced, applying all rules equally.¹²⁴ As the level of knowledge increases to the level of a competent performer, the correct treaties are being applied and are being prioritised in terms of their importance to the

¹²⁰ Flyvbjerg, *Making Social Science Matter*... 39-44.

¹²¹ Flyvbjerg, *Making Social Science Matter*... 42.

¹²² Flyvbjerg, *Making Social Science Matter*... 71.

¹²³ Flyvbjerg, *Making Social Science Matter*... 11.

¹²⁴ Flyvbjerg, *Making Social Science Matter*... 12.

situation.¹²⁵ With experience, an individual making use of linear processes such as the OPP can achieve the level of competent performer. Moving beyond this though requires a shift from rules based decision making to context based. At the level of a proficient performer, a deeper understanding of the problem causes context and situation to take priority while analytically the rules are being applied to the specific situation in the formulation of conclusions and plans.¹²⁶ The final level that can be achieved is that of an expert who is capable of taking in all information understanding the full context of the situation, applying the rules while accounting for the subtleties. Within this context the correct rules and capabilities are applied in the most appropriate manner to achieve the desired effect.¹²⁷ The beginner, advanced beginner and competent performer will be able to conduct some counter proliferation activities but their focus on the rules (the enemy threat, capability of tactical elements and the applicable treaties) prior to viewing context will hinder their fulsome analysis of the problem space. For counter proliferation there is a need to operate at the proficient performer and expert level, where context is fully analysed and the rules (strategic, operational and tactical aspects) are then applied to the situation. This shift is a necessary transition and requires a shift from the linear to the non-linear forms of thinking. Thus the linear form of OPP will never allow a planner to transcend from a competent performer to a proficient performer must less achieve the level of expert.

¹²⁵ Flyvbjerg, *Making Social Science Matter...* 12.

¹²⁶ Flyvbjerg, *Making Social Science Matter...* 16.

¹²⁷ Flyvbjerg, *Making Social Science Matter...* 17.

In achieving this move from rules to context based problem solving, Flyvbjerg recommends the following:¹²⁸

- Focus on values,
- Place power at the core of the analysis,
- Get close to reality,
- Emphasise little things,
- Look at practice before discourse,
- Study case and context,
- Ask how through narrative,
- Join agencies and structures, and
- Dialogue with multiple voices.

Simplifying this list, the underlying concept is to achieve an understanding of the context of the problem and then applying the various rules. Within the understanding, all details are important as is the manner in which the problem is framed. Once the context and rules of the problem are understood then the solution becomes apparent and the application of the solution intuitive. This context of developing a greater understanding of the problem space before moving to develop solutions, the proficient performer and expert levels of problem solving, form the foundations of design theory.

¹²⁸ Flyvbjerg, *Making Social Science Matter...* 130-138.

Design Theory

The application of the social sciences to military planning is best encompassed in the concepts of design theory. Design theory is not a new concept to the CAF and experiments conducted in the past on its utility have seen promising results.¹²⁹ The application of design however is complicated as it is not a step by step process and is abstract in nature. Design itself requires critical thought, innovation and creativity when addressing a problem.¹³⁰ This makes standardisation, teaching and implementation a difficult process. In fact, standardisation of the process would remove many of the benefits of using design theory. There are however guiding principles and considerations that can be taken into account. This is all done within the concept of a narrative with systems and sub-systems.¹³¹ The concepts of design are similar to engineering as diagrams are preferred over words and the interaction of multiple components operating under different rules must be considered and integrated into the overall solution. Thus the planner is freed from the limitations of language in developing a solution.¹³²

¹²⁹ Anderson, "From Systemic Operational Design (SOD)" ..., 23.

¹³⁰ Stefan J. Banach and Alex Ryan PhD, "The Art Of Design: A Design Methodology," *Military Review* 89, no. 2 (Mar, 2009): 105.

¹³¹ Perez Celestino (Lieutenant-Colonel), "A practical Guide to Design A way to think about it, and a way to do it," *Military Review* (March-April 2011).

¹³² Anderson, "From Systemic Operational Design (SOD)" ..., 44.

Before moving into design, the value of models and metaphor must be considered. Through the use of metaphors and a narrative, it is possible to gain a deeper understanding of the problem as the abstract concepts are brought into a context that is comprehensible to the planner.¹³³ Sources of metaphor for military planners can come from any number of sources but history, sports, the performing arts, stories, music and the visual arts tend to be the most prevalent.¹³⁴ These fields provide any number of possible metaphors to base the plan on such as historic analogies, myths, engines or complex biological systems.¹³⁵ By being mindful of how metaphors are used, a planner is capable of negotiating highly complex or wicked problems through a familiar framework. This tool can enable deeper understanding of the problem so long as the planner does not allow the model to overtake the considerations being considered.¹³⁶ By being mindful of the problem being addressed, the ability to reframe the problem in this manner enables the planning process in dealing with wicked problems.

With respect to conducting design four principles have been postulated. These principles with how they apply to the issue of counter proliferation are as follows:

¹³³ Chris Paparone, *The Sociology of Military Science: Prospects for Post institutional Military Design* (New York: Bloomsbury Publishing, 2013), 32.

¹³⁴ Paparone, *The Sociology of Military Science...*, 41-56.

¹³⁵ Paparone, *The Sociology of Military Science...*, 65.

¹³⁶ Paparone, *The Sociology of Military Science...*, 66.

- Avoid forcing the solution:¹³⁷ The old quote of “I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail”¹³⁸ highlights the first principle of design. This is important as it is necessary to base the solution on the problem, not the tools available to solve the problem. With respect to counter proliferation, an analysis of the actual problem to be considered must be undertaken followed by an analysis of possible solutions. This is a change or reversal from the normal of reviewing the military assets available and then considering how they may be applied to the problem space.

-Allow the solution to emerge over time from context:¹³⁹ This is a follow on to the first principle. This ensures that the solution and the problem are naturally linked as opposed to a forced coupling. The issue of solving proliferation issues is difficult as the consequences for failure are so high. The need to be doing something at times over rides the patience required to ensure that the right thing is being done. In this case, the context of the Canadian counter proliferation space and the proliferators’ operating environment must be considered as context.

¹³⁷ Celestino, “A Practical guide to design...” 48.

¹³⁸ Abraham Maslow, *Psychology of Science*, (Maurice Basset Publishing) 1966.

¹³⁹ Celestino, “A Practical guide to design,” ..., 48.

-Consider taking actions to learn about the environment:¹⁴⁰ This feeling out process is a method of verifying that the understanding of the system is in fact a true representation of how the system operates. The goal here is not to break the system through action but to test it. In this manner, some stimuli may reveal connections or weaknesses not otherwise observed. With respect to the friendly space, the role of exercises can be highlighted as they provide a low stress test of the system.

-Reframe the problem if necessary:¹⁴¹ This is the summation of the previous principles. As the context of the problem becomes clearer through testing and the solution begins to emerge, it may be necessary to reframe the narrative. This is not a negative sequence as it shows an evolution towards the final version of the solution space.

Much like the principles, the considerations do not prescribe the methods by which planning is to be conducted using design, but certain key points to consider throughout the process. The principles are as follows:

-Appreciate the game by not studying the pieces:¹⁴² With the gear model, this implies understanding the interactions and the environment. As such the focus should be biased towards the connections more so than the individual gears.

¹⁴⁰ Celestino, "A Practical guide to design," ..., 48.

¹⁴¹ Celestino, "A Practical guide to design," ..., 48.

¹⁴² Ben Zweibelson (Major), "An Approach to Ill structured Problems," *Military Review*, (November-December 2012), 81.

-Know how to wash babies before throwing out the bathwater:¹⁴³ This is important to the gear model as we must factor in the specific habits and tendencies of the CAF, specifically their indoctrinated planning paradigm. This planning system must be understood and accounted for as it remains an influence on how solutions are understood by practitioners.

-In a complex environment nosebleed seats are best:¹⁴⁴ In counter proliferation we see the importance of this as it may seem reasonable to study a particular aspect of the problem, but doing so will cause the planner to miss the context of the situation. It is important to step back from the situation and absorb context over specifics.

-The displeasure of the organisation may be a positive sign:¹⁴⁵ When facing a wicked problem, outside the box solutions, although appropriate, may cause friction with conventional thinkers. This may be an indicator that the planner is on the correct path as the solution may not be aligned with what the commander was hoping for, demonstrating that designers have gone beyond the conventional analysis of the problem.

-Embedded ideas are difficult to change:¹⁴⁶ Once a concept is embedded it may be hard to change. Referring to the considerations of design however, this may indicate a need to reframe the problem. In reframing the problem, old concepts must be removed

¹⁴³ Zweibelson, “ An Approach to Ill structured Problems,” ..., 82.

¹⁴⁴ Zweibelson, “ An Approach to Ill structured Problems,” ..., 83.

¹⁴⁵ Zweibelson, “ An Approach to Ill structured Problems,” ..., 83.

¹⁴⁶ Zweibelson, “ An Approach to Ill structured Problems,” ..., 84.

from the lexicon of the solution. Additionally, planners must be wary of the influence of old ideas trying to impose answers on the problem space.

-Non-linear solutions are not linear in nature:¹⁴⁷ This requires the planners to understand the situation and to demonstrate creativity and consideration in building the solution. It is not enough to plan from a fixed procedure in design, but to be flexible in both the process and in the outcome, tailoring both to the problem.

-Emergent work is not the final result:¹⁴⁸ Planners must be aware of this and be careful not to create expectations on the solution as they are working towards it. As the gears here were used as a planning model to build comprehension of the problem, the gears themselves are not the final postulation of a solution. They are simply a necessary step in the evolution of the understanding of the problem space.

Conclusion

From our analysis of the various problem solving methods available, we can begin to see that design theory may provide the most benefit as a planning framework. While the OPP is firmly embedded into the CAF doctrine and culture, its rigid processes and linear nature make it ill-suited for applications in wicked problems such as counter proliferation. Use of the OPP would require modifications to the existing method that may not be palpable in most organisations so the introduction of a new method would

¹⁴⁷ Zweibelson, “ An Approach to Ill structured Problems,”..., 85.

¹⁴⁸ Zweibelson, “ An Approach to Ill structured Problems,”..., 86.

likely be more effective. The theory is difficult in its non-linear approach to problem solving, but this non-linearity makes it ideally suited for application against a wicked problem. If other organisations wish to adopt the selected method, they should do so only after viewing whether the method is appropriate to their own needs. With respect to the planning of counter proliferation activities, design theory is seen to offer the correct characteristics to be an effective problem solving framework for the issue.

CHAPTER 4: DESIGN THEORY APPLIED TO COUNTER PROLIFERATION

Introduction

In order to demonstrate that a design approach to counter proliferation is both possible and appropriate, the moral sin of not fully addressing the entire issue shall be committed. It is necessary to be forthright that all work up to this point has been conducted in order to facilitate the application of design to this problem space; in a way design was used to demonstrate its application to the proliferation problem. In applying the theory, the defence of Canada and Canadian interests shall be considered against the threat of proliferators where the proliferators either intend to attack Canada or use Canadian geography as a route to attack our allies. The solution to the problem shall focus on the concept or “game” of counter proliferation as opposed to the tactical elements or “pieces”.¹⁴⁹ In doing so, it is necessary to step back from the problem and view it again from arm’s length¹⁵⁰ to gain an appreciation of the subtleties of the systems and sub systems engaged in the solution space. In doing so it is necessary to reframe our problem space,¹⁵¹ adapting the gear model as the solution naturally evolves.¹⁵²

¹⁴⁹ Zweibelson, “ An Approach to Ill structured Problems,” ..., 83.

¹⁵⁰ Zweibelson, “ An Approach to Ill structured Problems,” ..., 84.

¹⁵¹ Zweibelson, “ An Approach to Ill structured Problems,” ..., 85.

¹⁵² Zweibelson, “ An Approach to Ill structured Problems,” ..., 86.

In doing so the gear narrative shall be reintroduced and reviewed specifically with respect to the elements necessary for defence of Canada. From there, the model shall be reframed and a narrative developed to demonstrate how Canada should frame counter proliferation efforts with respect to domestic defence. The narratives metaphorical nature will remain mechanical and shall build upon the gear concept used thus far. Once the narrative is established, the gears of counter proliferation shall be applied within the narrative, taking on the form of systems and sub-systems. The objective here is to demonstrate that this wicked problem, when put through design supported by a narrative can become comprehensible to all actors within the field, building a common understanding of the problem. This will lead to better coordination and more effective action.

The Gear model applied to defence of Canada

Within the gear model we can begin to identify a number of systems and subsystems all leveraging the Canadian influence on the event. At the strategic level, there are a system of laws and treaties both domestic and international framing the problem space. These are not so much gears and are in fact more a definition of the environment within which the gears operate. A separate system completely is that of the strategic leadership which does not directly influence the remaining gears, but provides guidance dictating the direction each gear should move within.

At what was the operational level, various systems begin to emerge whose purpose is to translate the strategic direction to the tactical elements. The tactical

elements themselves also form various types of sub systems within the overall system. Thus the tactical element takes on the role of a transmission or drive train converting strategic direction into tactical effects. The operational level becomes a sub-system within the strategic system.

Finally, the role of the tactical elements becomes clear, but distinctions in the various tactical elements begin to become apparent. First off are the tactical elements which directly influence the event through action. These elements form a sub-system of direct influence on the problem space. From this the intelligence network reveals itself as a separate sub-system, not influencing the problem space but providing information into it.

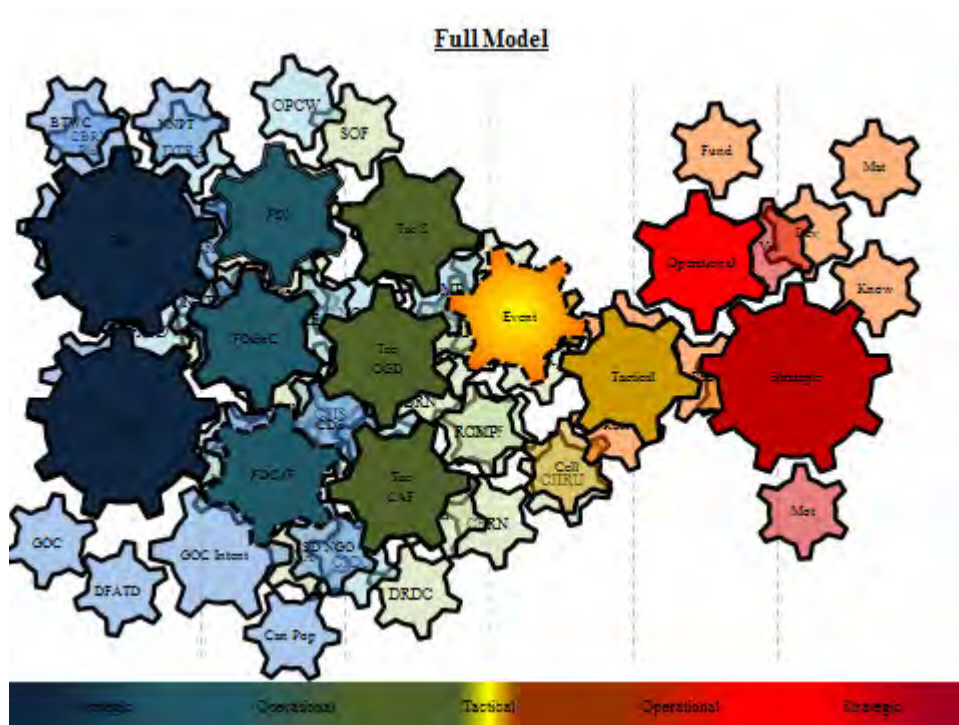


Figure 28: Gear model revisited

Thus the system of gears that was originally viewed can now be seen as a system with a number of subsystems. Organising these subsystems in a more coherent manner requires the gear narrative to be reconsidered. This is a key step in design as existing models or emergent concepts during the initial exploration of the problem, give way to newer more complete ideas. The gear model has therefore served its purpose as part of the design process, but must now be reframed so the problem can be better analysed.

Narrative, Systems and Sub Systems

In design it may be necessary to reconsider the narrative and reframe the problem. In doing so, one must consider the context within which design will be implemented, the problem which needs to be addressed and how the design will manage the problem.¹⁵³ Adapting the mechanical gear model, we reconsider the system of gears to that of vehicles driving down the road at night. This model is more appropriate for understanding the counter proliferation activities of States against non-state actors.

Each vehicle is a self-contained system representing a State, with each State heading towards a specific destination. This destination may or may not be known to other vehicles on the road, depending on the level of communication between vehicles. Vehicles may either move in support of each other as allies in order to overcome obstacles and overtake other vehicles, or may seek to enable the enemy non-state actors, referred to as Gremlins, in impeding the progress of vehicles they consider hostile.

¹⁵³ Banach, "The Art Of Design"... , 109.

Gremlins may either act on their own or be supported in supplies by sympathetic vehicles. Vehicles are unaware of how far they must travel to reach their final destination, much like states are never aware of what their final objective may be. However, the Gremlins will seek to create obstacles in the road to either take the vehicles off track or cause damage to the vehicles and their passengers.

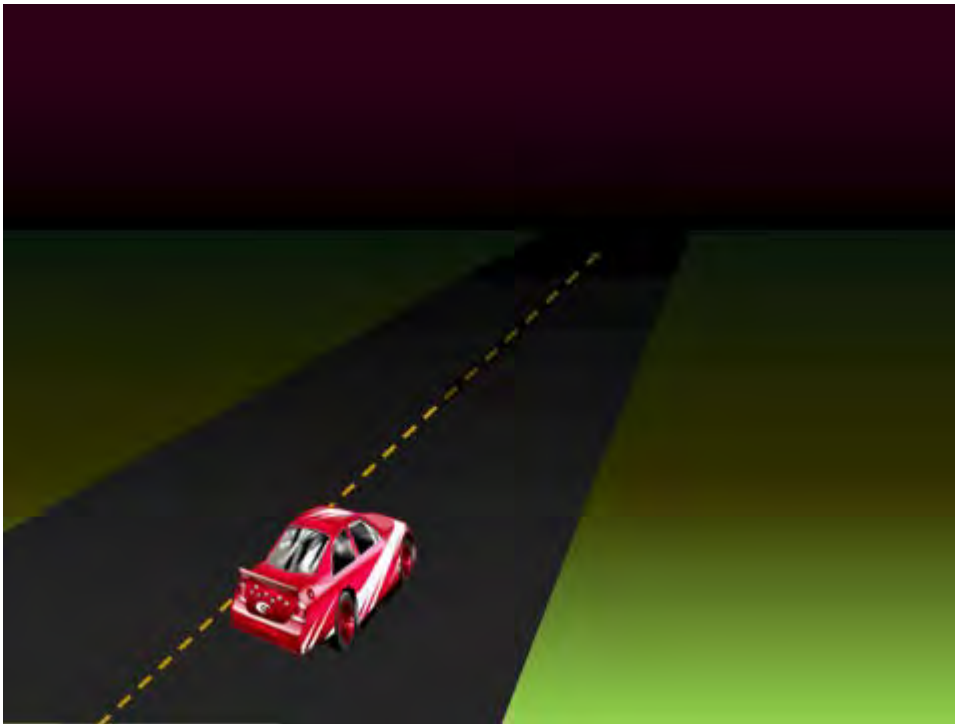


Figure 29: Counter Proliferation Narrative

Application of the model to the narrative: Strategic

Beginning with the strategic level, we begin to adapt the gear model to the new narrative. Within the strategic level there are clearly two systems at play, that of the vehicle and that of the systems outside the vehicle which bounds how the vehicles move and interact with each other.

Addressing what was the “Strategic: International” gear, we see that the ideas of the various treaties, laws and regulations are in fact the rules of the road. They dictate how the vehicles may interact with each other and under what conditions. The Australia Group is an example of “drivers’ education” whereby best driving practices in combatting the Gremlins are shared between like-minded vehicles. The strategic international also defines the natural condition of the road as strong treaties leave known and navigable terrain while weak treaties and legal loopholes create naturally unstable ground. This in turn results in the strategic level defining the conditions of the road, where “events” occur.

Understanding the space the vehicle is moving within and the way a vehicle interacts with its partners’ leads to the “Strategic: Domestic” gear which can be redefined as the Canadian vehicle. Within the vehicle we see the “drivers” which are the Government of Canada and those who may influence the direction of the country through diplomatic, informational, military or economic means.¹⁵⁴ Some drivers share a wheel while others have access to their own wheels. Influencing the drivers but not having a hand directly on the wheel is the passengers in the vehicle or the people of Canada. This group is of supreme interest as they are in fact the target of an attack. A proliferator’s goal is to either kill the passengers or create a situation whereby the passengers force the driver to change the direction of the vehicle. Interestingly, the passengers are not the

¹⁵⁴ CFJP 01..., 2-1.

element in direct contact with the road and do not have direct access to the steering wheel, but remain the target of the attack.

The final aspect of the strategic level is that the drivers of the vehicle have the best view of where the vehicle may be headed as they are sitting in the front seat. They communicate this to the passengers who then vote on where they would like to end up, but the passengers are hampered by not being able to directly view the road from the backseat. Also, the drivers or strategic leadership are the only ones capable of speaking to other vehicles, thereby informing them of Canada's intent moving forward. This is similar to the situation domestically where only key government personnel are fully aware of the threat and the operating environment and are the only ones capable of speaking to other drivers or key leadership directly.

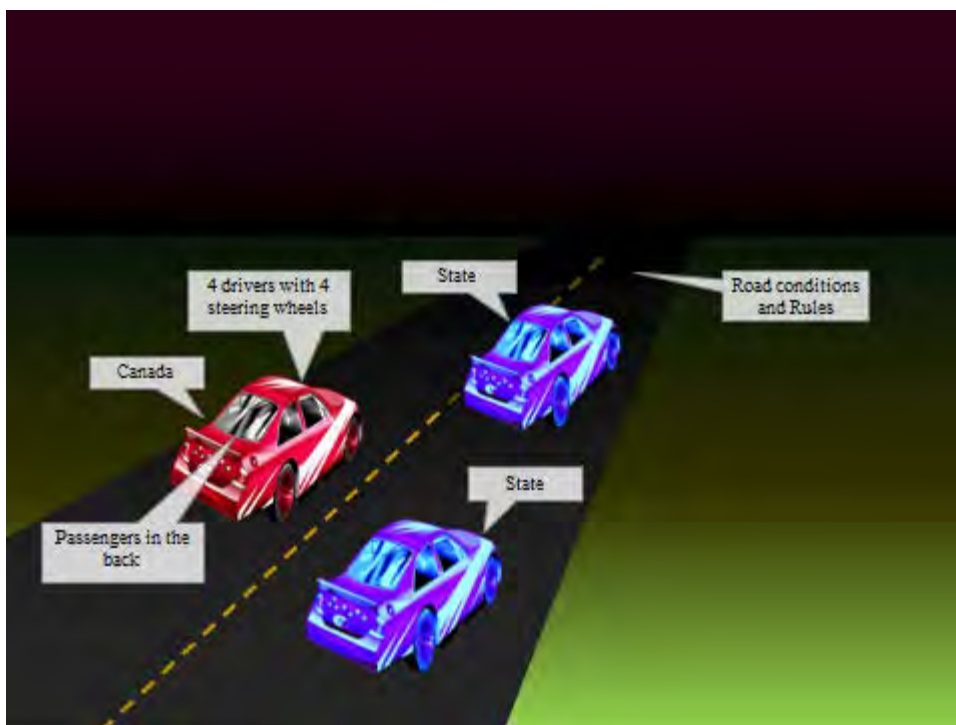


Figure 30: Strategic Model

Application of the model to the narrative: Operational

By further applying this model to the problem space we see a clear operational level. The operational level comprises the systems and subsystems not in direct contact with the road but that enable the driver to provide direction to the wheels. In this we see the issue of differing strategic visions being executed as different organisations have independent access to their wheels. Thus when the diplomatic driver pulls to the left, and the military driver pulls to the right, the diplomatic wheel turns left while the military gear turns right. The importance of an efficient and effective operational level is than clear as it has three functions, the first is to pass direction from the driver to the wheels and systems, the second is to ensure all the wheels are heading in the same direction and the third is to inform other drivers of the intention of the Canadian vehicle.

With respect to passing on direction from the driver to the wheels, we see a linear process that must be followed up and down. For the CAF, here is a case where the OPP is in fact effective and appropriate. The input from the strategic driver to the tactical wheel must happen the same way every time in a predictable manner. Additionally, there is an amount of feedback that the driver requires to “feel” the road, but the feedback cannot be so great as to overpower the driver. Thus the various operations centres must operate under established and predictable patterns providing the correct amount of power in the correct direction at the correct time to their tire.

The second role of the drivetrain is more complicated and less linear in nature, where the OPP is not appropriate. In this the operational level must account for the actions of the other wheels adjusting their own actions as necessary to ensure that the course is followed. For example, if one wheel is moving too fast or is slightly out of alignment, the operational element must provide feedback to the other operational drivetrain and adjust its own wheels to compensate. This is complicated as the CAF's reactions will be hampered as the other wheels also try and compensate. This requires a cyclical and continual analysis of the situation compensating for other departments and reacting to their efforts while still following the driver's directions.

Finally, while the driver is capable of calling other drivers to signal the direction of the vehicle in the long term, it is the role of the operational level to handle the near term information passage. This is done by manipulating the turn signals to ensure that surrounding drivers are aware of Canada's intent, specifically when entering or exiting their lane (or region of the world). Signals are also necessary at the operational level to inform partner vehicles of sudden adjustments in course or to warn of upcoming hazards.

At the operational level, the lack of a proper transfer between the driver and the wheel, while informing surrounding elements would lead to issues with counter proliferation efforts. Inefficiencies would be created as the wheels are worn out as they are continuously brought out of alignment. Also, a failure to signal intentions to surrounding drivers results in frustration on their part and an unwillingness to assist Canada.

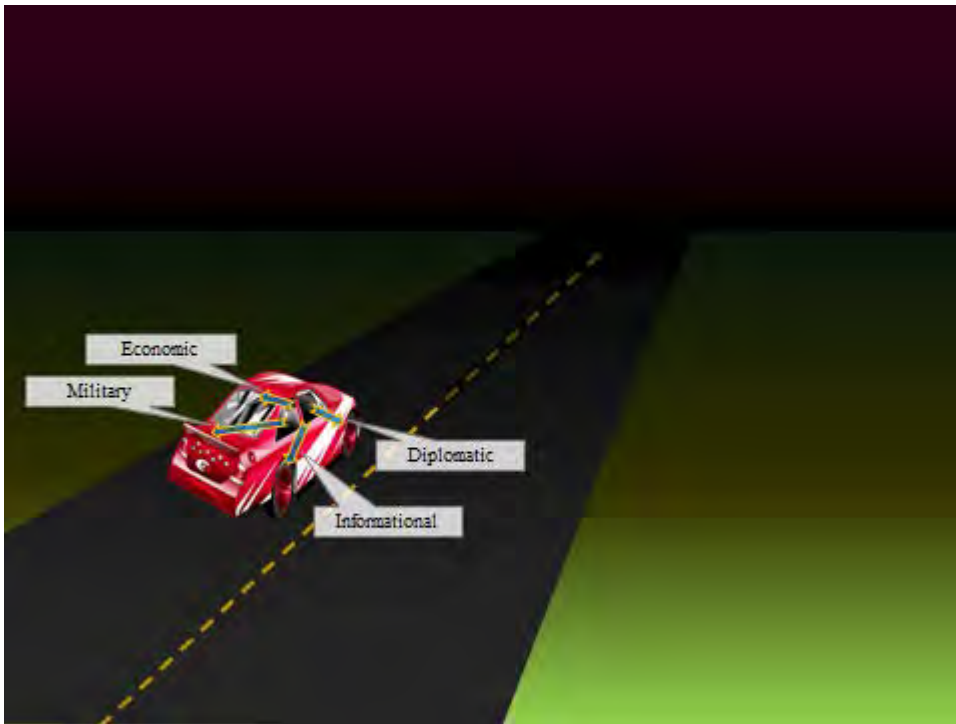


Figure 31: Operational Model

Application of the model to the narrative: Tactical, wheels and lights

The tactical portion of the model is where we see the ability of the vehicle to influence where it is and its interactions with the event. As we look at the various tactical gears though, we begin to realise that we have a number of subsystems within the Canadian vehicle. The key subsystems here are the wheels, lights and brakes.

The wheels are an obvious element of this narrative. They provide contact with the event space and are the influence between decisions and actions. Here we see that there are specific wheels for specific tasks. At times a large heavy duty military grade wheel is required, while other situations require a softer more diplomatic wheel. In most cases, it will take a combination of multiple wheel types in order to effectively allow

Canada to negotiate the terrain. In this we see the application of the various tactical elements to the event space. Further to this, understanding the wheels of the allied vehicle is important so we are aware of their own capabilities and how that may cause their vehicle to influence Canada. Although it may be desirable to have all wheels engaged at all times and the best quality wheels, this is often not possible due to cost and tire wear. Therefore, it is necessary to have the appropriate wheels available at any time to handle any problems that are forecasted. The wheels must be able to be engaged in time to alter the course of the vehicle to avoid the obstacle, or must be strong enough to bear the brunt of a negative impact with the road. The first responder community which tends to be the front wheels and are often in contact with a problem prior to the larger wheels in the rear must be considered at this point.

In terms of the amount of time available to engage the correct tire or avoid an accident initiated by the Gremlins, we see the role of the intelligence community or the headlights. It is never possible to see the final destination as the final destination is unknown. This is further hampered by darkness and bends in the road causing blind spots. The intelligence community however represented by the lights must be capable of allowing the driver to see far enough ahead so that appropriate actions or preparations can be taken to avoid or mitigate an event. Within the intelligence domain we see an ability to assist allied vehicles as Canada casts light on their own roads or pass on information on road conditions as they become apparent. Reciprocally, other countries may do the same for Canada as long as relations remain favourable. The key remains that Canada will

never be able to see the entire road, but needs to be able to see far enough ahead and with enough clarity to avoid a critical event, aiding allies when possible.

The final aspect of the tactical level is the braking system. Here all elements of the system from the drivers and passengers, to the drivetrain to the other wheels may apply braking to the system. This may be a case of fear of moving too fast or in order to avoid an accident. Sometimes the braking is caused unintentionally as some elements of the vehicle slow things down simply because they cannot handle the speed. This sub-system with all its connections must be considered and understood in addressing counter proliferation issues which may be time sensitive in nature.

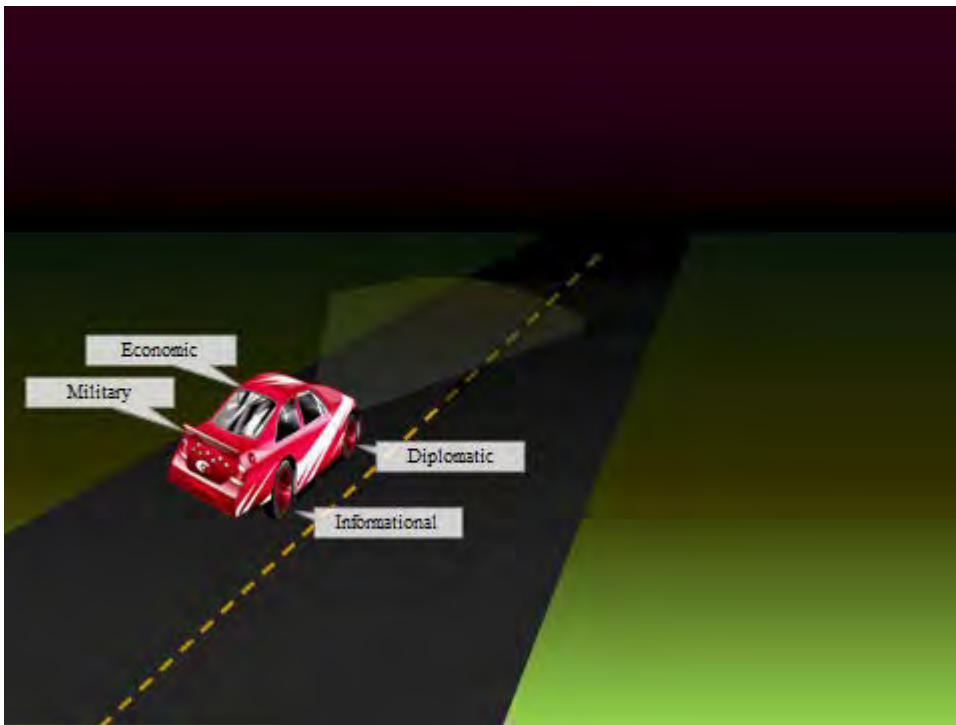


Figure 32: Tactical Model

The Enemy System: The Gremlins

The enemy system as presented can be simplified rather easily to the concept of Gremlins. For any number of reasons, the Gremlins want to injure or influence the passengers in the car. They may have been passengers in the car who have become disenfranchised or were passengers in another vehicle who now want to influence the Canadian vehicle. In some cases, these Gremlins may be doing damage in order to collect parts in order to build their vehicle so that they may drive down the road. Understanding the Gremlins motivation and vision for an attack is the first part of avoiding an accident.

Beyond this, it is necessary to ensure that the Gremlins never gain the tools they desire or the knowledge on how to use the tools they obtain. As the Gremlins look to create potholes in the road, there is a need to assess the size of hole they can make and how quickly they can create them. Can the gremlins create large holes right in front of the wheels or can they only create smaller holes much further down the road? Both the size and speed of the creation of potholes are important as this drives the friendly decision on how nimble the vehicle must be, how far forward the vehicle must be able to see and how much control the driver must have on the wheel. The cost of a nimble vehicle with all seeing headlights and a driver with a firm grasp on the wheel may be too much economically or morally for most democratic states. From this simple narrative we can begin to consider key real world issues such as government span of control over the population and the authorities a population is willing to give to intelligence agencies.

Finally, we can address the Gremlins themselves at the tactical level. For counter proliferation we must understand where the Gremlins are, how they are organised, who speaks to who and who shares what with whom. Counter proliferators must be familiar with their habits and cognisant of their aims. Most importantly, counter proliferators must acknowledge that there are in addition to Gremlins on the side of the road, there may be other people. There are passengers of failed vehicles who are now walking along the road, as well as innocents who simply decide to walk along the side of the road as a life choice. Separating innocent persons and Gremlins may be difficult, but is necessary as indiscriminate attacks may have impacts with the passengers of the Canadian vehicle.

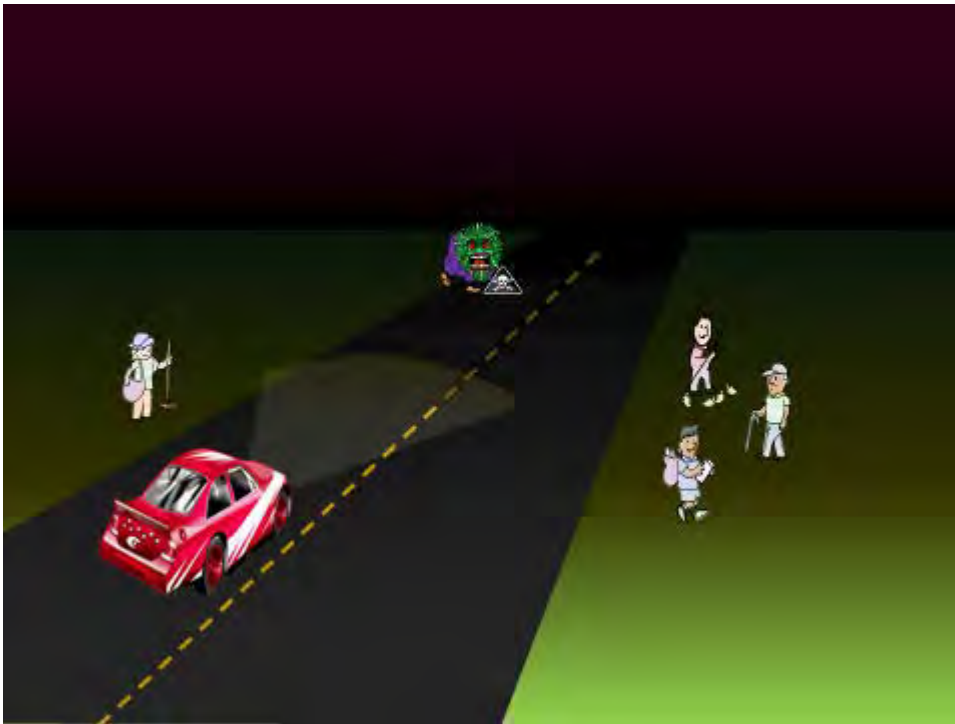


Figure 33: Enemy Model

Why the narrative helps

From this simple application of design to the issue of defence against attack by proliferators we begin to see the advantages in overcoming the weaknesses inherent in linear problem solving methods. In this case a simple and narrative can be used to bring to bear some incredibly difficult concepts thereby building a common understanding of the problem space. Additionally, new strategic direction, operational influence or the addition and removal of tactical elements can take place without significantly affecting the planning space. Most importantly, we begin to tame the wicked problem by acknowledging how the various pieces fit together and interact with each other within the problem space.

From the simple narrative, all parties are able to conceptualise how it is they may fit in with the overall system. More importantly they are able to begin to understand how other organisations may fit in within the overall system and begin to understand their roles within the friendly portion of the problem space. Concepts such as the capability of intelligence coupled with the agility of tactical elements can be long debated as to which is more important, but when simplified to the concept that headlights need to illuminate the road far enough in advance to allow reaction by the steering and tires, the interplay between the two becomes clear. It is not necessary to know everything about the enemy proliferation network as long as there is time to react appropriately. For some obstacles Canada needs to be agile enough with high response tactical units to avoid the obstacle

where the level of readiness is therefore linked to level and fidelity of warning, while other situations do not require the same capabilities.

Also of key importance through this narrative is the ability to maintain the planning concepts as strategic direction changes, operational interactions improve or deteriorate, tactical elements are added or removed, or based on any activities by the proliferators. From here, a change in government does not require planners to rewrite the entire solution space as they are able to simply adjust one aspect of it giving it more or less power. Enemy actions can come and go as they are revealed without changing the overall plan. More importantly the actions of the tactical elements can be rationalised based on their ability to interact with the enemy actions while protecting the passengers.

From this, a non CBRNE or non-proliferation expert can thereby quickly assimilate the key concepts and become a useful part of the solution space without an understanding of the specific drills of the tactical elements. More importantly, through design, experts and non-experts alike who influence the problem space can speak to the interactions within the problem from a common lexicon, which can be maintained even after changes to the situation. A change to the situation in this case, does not require a new plan, simply an adjustment of the existing one.

CHAPTER 5: CONCLUSION

Review

The concepts present within design are not new. They have a long history in the world with effective leaders demonstrating an understanding of the key principles. These leaders may not have formalised the concepts, but in their words and actions we see the premises of the theory displayed. In revolutionary China, Mao Tse Tung inherently summarised the concepts of design theory:

It is well known that when you do anything, unless you understand its actual circumstances, its nature and its relations to other things, you will not know the laws governing it, or know how to do it, or be able to do it well.¹⁵⁵

We see a realisation that context mattered as he looked to reimagine China. In doing so, the various layers of society needed to be understood and the second and third order effects of actions needed to be accounted for. Context was understood, a narrative was built and all actions took place to support a still emerging end goal.

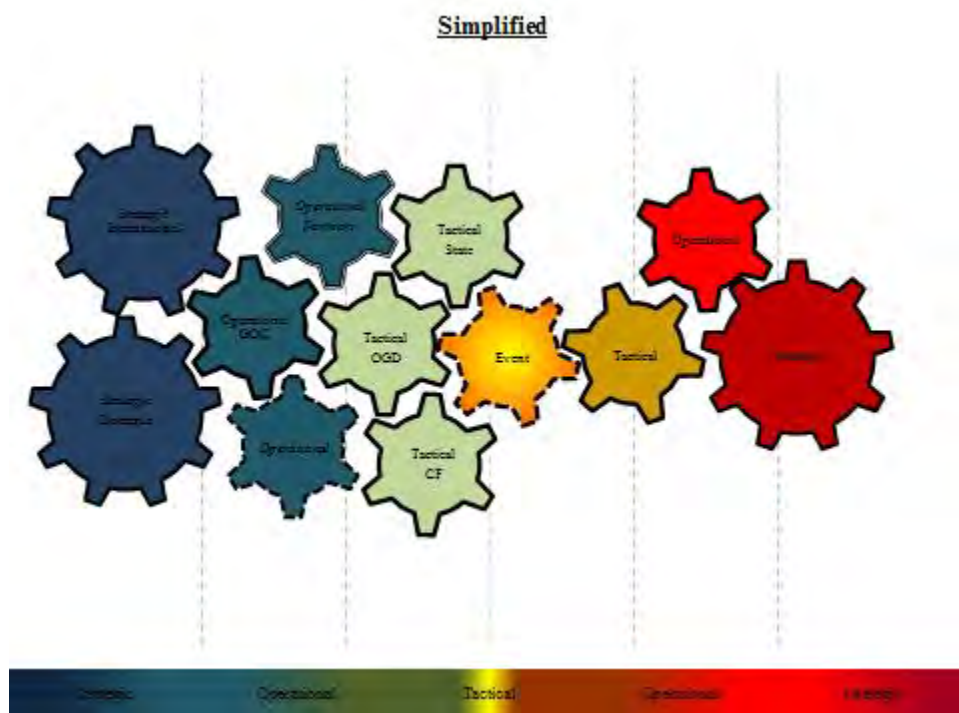
With respect to proliferation, history has shown that the use of a CBRNE device to pursue terrorist aims is not beyond the intent and in some cases capability of current terrorist organisations. Individuals with specific knowledge and access have executed attacks on their own, while major terrorist networks continue to seek weapons capable of meeting their visions for an event. When considering the defence of Canada, the

¹⁵⁵ Mao Tse-Tung, "Problems of strategy in China's Revolutionary War," December 2936, in *Selected Writings of Mao Tse-Tung* (Peking: Foreign Language Press, 1968), 77.

probability of such an event happening must be weighed against the result of a successful attack. With the role of the CAF being the defence of Canada, military planners must be prudent in preparing for such an event given the impact such an occurrence would have on the country. With that in mind, the CAF must be careful in their efforts as they are one of many organisations with a role to play in this problem space. The efforts by any single organisation must always be conducted mindful of the repercussions these actions or lack of action have across the system.

Analysis of the problem space therefore becomes critical. Common to terrorist activities is their desire to ensure that their efforts and planning are protected so that they may execute an attack when and where they desire without interference. This inherent lack of transparency is normal in warfare. What is different here is the lack of understanding of the friendly problem space. The problem space itself is wicked in nature. In addressing the various cause and effect relationships within the problem space, this analysis applied the concepts of design. It is only through the application of this concept that the idea of gears could be brought forward and the various interactions could begin to take shape. Other problem solving methods were simply inadequate to properly comprehend the problem space as it requires an iterative analysis of the problem as new elements were added. From this, the scope of this project was limited to understanding the problem space and an analysis of possible ways by which the solution space could be fully explored.

In addressing the wicked problem which is counter proliferation, a nonlinear approach is required, and the use of design theory should be explored by the CAF for this particular problem set. What is required is the move from science, the analysis the specific rules and interactions, to engineering, the analysis of the complete system within an environment and the application of rules based on context. This mental shift from linear to non-linear problem solving methods is necessary to fully grasp the problem being faced. In engineering multiple considerations are put forward and a design is produced in order to address an issue. Diagrams are common and take precedence over written work. In written work the only possible option is to provide a linear solution as the reader must begin at the top left portion of the page and absorb ideas line by line as they are presented. In the diagrams of design, the entire concept is put forward and the reader is given the opportunity to drill into the specific portions as they absorb the information, always aware of the big picture, but able to study the details. In this the concept of gears was introduced.



The narrative of the gears allows for the building of a foundation of knowledge with respect to counter proliferation problems and allows a framework of understanding enabling a practitioner to begin the journey from beginner to expert.¹⁵⁶ This in turns allows understanding beyond the rational behaviour of actors within the problem space, but a developed intuition and knowledge of irrational activities and behaviour.¹⁵⁷ The evolution and reframing of this narrative was from gears to that of a car moving down the road.

¹⁵⁶ Flyvbjerg, *Making Social Science Matter...* 10.

¹⁵⁷ Flyvbjerg, *Making Social Science Matter...* 22.

The car moving down the road has been provided simply as a demonstration of the utility of design in addressing the counter proliferation problem. Concepts such as the role of international organisations to provide checks and balances on the Canadian system acting as friendly speed bumps as well as internal differences in opinion causing intentional slowing of the system were not explored but demonstrate that the concept can be expanded upon. The ability to expand on the problem incorporating new concepts highlights another key benefit of design. The car model did show the role of the various systems and sub-systems within the vehicle all interacting with one another. In order to be effective and to avoid an accident, it is necessary for all of these systems to work together in order to protect the passengers.

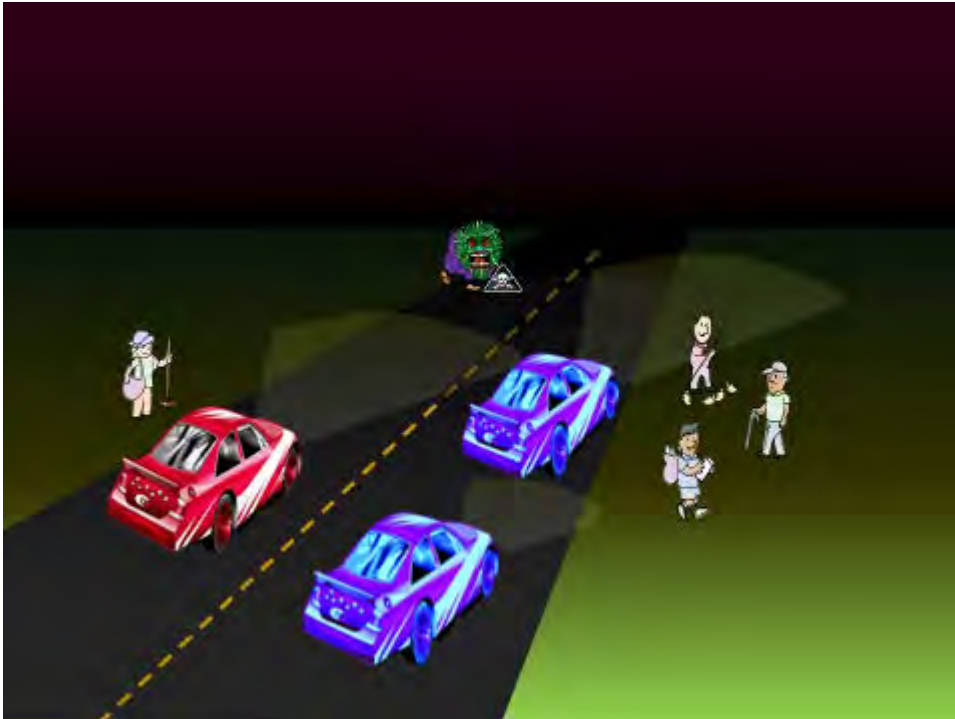


Figure 34: Design Theory Applied to Counter Proliferation

Conclusions

All of this analysis has resulted in three final conclusions for this project. The first is that counter proliferation is, by definition, a wicked problem. The second is that design is the most effective way in addressing the issue of counter proliferation. The third conclusion is that the models built thus far are steps towards a complete solution but not the final stage. These conclusions build upon each other.

With respect to counter proliferation being a wicked problem we see this in more than just the definition of wicked problems. The problem itself evolves and changes, refusing to be tamed, and thus creates difficulties for problem solvers. Counter proliferators must amend their methods as the proliferators look to overcome any solution that counter proliferators develop, exploiting the gaps in the treaties and the blind spots from the intelligence agencies. Acknowledgement of the problem as being wicked in nature is an important first step in taming the problem as it accepts that innovative problem solving methods are necessary.

In continuously amending the methods, the concepts put forward in design theory are seen to be highly effective. As design is not rigid relying on analysis and comprehension it remains flexible enough to deal with changes in the situation, bending but never breaking. This focus on context over rules lends itself to deeper understanding of this issue. This focus on a deeper understanding of the problem provides opportunity

to fully realise possible solutions to the issue breaking from existing concepts which may not be appropriate to this problem set.

Finally the gear model as depicted originally followed on by the model of the car, are not the final depictions of the problem space. As is necessary in design to reframe the problem as comprehension of the situation grows, the model itself will continuously evolve. The reliance at these stages on physical models for understanding must eventually give way to more abstract concepts to understand the deeper issues at play.

From these three conclusions future work into the project may move forward. The goal of this work was not to solve the counter proliferation issue or develop a counter proliferation plan for Canada. The goal was to determine if the planning methods in place were appropriate to the problem set and if not to explore a method that was. Clearly a non-linear problem solving method is required and design theory provides the fundamental concepts necessary to address this issue.

Future Work

The issue of proliferation of CBRNE technology to non-state actors looking to pursue their aims through terrorism is likely to remain of concern to the GoC. Further analysis into the problem is required and should focus on two major themes. The first theme is that of the individual pieces themselves while the second is on the interaction of the pieces. With respect to the individual pieces, a greater understanding of the various groups, organisations and the established formal and informal links between them needs

to be undertaken. This would consist of both research into the enemy and friendly portions of the problem space. The purpose of this would be to provide higher fidelity information into the problem space development. This would be the science. The second and more complicated aspect is that of the design of the problem space. It is recommended that the “car on a road” narrative here only be used to introduce the concept, but not be the end state as it lacks the level of abstraction necessary to fully integrate all aspects of the issue. The development of the abstract model using design in order to build a common narrative is the next step. This model must be capable of integrating changes in the enemy and friendly tactical, operational and strategic elements. This move from science to engineering is the necessary and most difficult part of developing a counter proliferation strategy to protect Canada and Canadian interests.

Final Thoughts (coming clean)

The goal of the paper was originally to demonstrate why Special Operations Forces (SOF) are a key element in counter proliferation activities for Canada and a leader in the field for the CAF. The organisations within it have special skills and capabilities appropriate to the problem set which has led to conduct counter proliferation activities¹⁵⁸ being a mandated task to CANSOFCOM.¹⁵⁹ At the start of the process of this paper, the

¹⁵⁸ The task is officially listed as combatting weapons of mass destruction. The sub task of counter proliferation is listed as a task force specific task within the combatting weapons of mass destruction umbrella.

¹⁵⁹ Department of National Defence, “Special Operations Forces, Operational Tasks,” last accessed 4 May 2014, <http://www.forces.gc.ca/en/operations-special-forces/index.page?>.

concept of design was new and abstract. Concepts such as agility, flexibility and creativity as well as understanding context through the need to be culturally attuned are expected to come naturally to those operating in the world of special operations.¹⁶⁰ As time went on, the similarities in the concepts of design and the characteristics of special operations thus became clear. With an understanding of the game that is special operations and a new understanding of the game that is counter proliferation, the tactical capabilities present within CANSOFCOM are no longer the focus. It is clear that the ability to conduct design is the true skill set that will allow CANSOFCOM to conduct counter proliferation activities and it is this focus on the mindset that must be emphasised over the ways and the means to conduct the tasks.

¹⁶⁰ D Michael Day and Bernd Horn, "Canadian Special Operations Forces Command: The maturation of a national capability," *Canadian Military Journal* Vol 10, No 4 (Autumn 2010), 70-72.

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