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THE FUTURE OF COMMAND AND CONTROL IN THE CANADIAN FORCES

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CONTENTS

ABSTRACT

Command and control has been an essential tool in allowing military commanders to wage war. Past conflicts have demonstrated the decisiveness of command and control as a weapon in and of itself. Napoleon's creation of Corps and Divisions with their supporting staff revolutionized command and control in a way that continues today. The many Revolutions in Military Affairs (RMAs) that changed the nature of warfare to what it is today did not happen over night. In many cases, these RMAs were deliberate paths chosen to transform the nature of an organization to something entirely different and more effective. The Information Age is challenging the Canadian Forces to just such an RMA. The Canadian Forces solution to this RMA is a multi-headed beast that can only be slain by an organization with a *zeitgeist* of innovation to change.

The solution that is calling the Canadian Forces necessitates a change from a traditional, hierarchical Command and Control structure to a more networked, flatter, agile organization. Changing from one organization to another will be difficult and affect Canadian Forces culture, doctrine, equipment, training, and how Canadian society understands warfare overall. The only certainty in the future is change, therefore the best way to prepare for it is to keep an open mind, and adopt solutions to Command and Control that will give the Canadian Forces the best chance at handling the challenges that lie ahead.

CHAPTER 1 - INTRODUCTION

> …only humans command. All other concepts, technologies, doctrines, standard operating procedures, training, systems development, and so on, must support this pivotal axiom. We believe that C^2 must be defined and discussed from a uniquely human perspective – one that is consistent with the prevailing operational experience, yet provides novel and productive avenues for improving overall effectiveness and efficiency.[1]

Carol McCann and Ross Pigeau, two Canadian defence researchers, assert that militaries exist primarily to resolve human conflict. Command and Control (C2) is fundamental to these military operations which, despite any advances in technology, continue to be human endeavours. The 'man in the loop' in charge of these military 'levers of power' on behalf of government, must exercise C2 as a key tool to mission success. Historically, C2 has been one of those elements that have fallen under scrutiny as being decisive in both victories and defeats, regardless of the nation or tradition of warfare that they practice. The Canadian Forces is no exception to this rule.

Major General M. Jeffery expressed his concern over the future of C2 in the Canadian Forces (CF); centred on the growing complexity of operations and the demands that this places on the commander and the supporting C2 structure. More specifically, he argues that we are facing an organizational crisis and a call to pragmatically review the assumptions, practices and organization of C2 within the Canadian Forces.[2] This paper will take up that challenge, and analyze the steadily-growing body of knowledge regarding the future of C2 at large, followed by a more focussed look at the Canadian

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[1] Carol McCann and Ross Pigeau, *The Human in Command: Exploring the Modern Military Experience*, (New York: Kuwer Academic/Plenum Publishers, 2000), 181.

[2] Major-General M.K. Jeffery, "Foreward" to *The Human in Command: Exploring the Modern Military Experience*, (New York: Kuwer Academic/Plenum Publishers, 2000), 181.

Forces today. The central thesis herein is that future C2 structures in the Canadian Forces will need to move away from a hierarchical structure to a flatter, more agile one.

Command, Control, and Command and Control (C2) are terms that can be defined in many different ways. Indeed, the words that are used and the way they are defined automatically "…limits the available solution space" and may "point[s] us in the wrong direction when discussing the issue."[3] For sake of clarity, and in keeping with the research that is being done within the context of the Canadian Forces, the definition of command and control used throughout this paper shall be:

> **Command: "***the creative expression of human will necessary to accomplish the mission."*
>
> **Control: "***those structures and processes devised by command to enable it and to manage risk"* [4]

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These definitions are very different from many of the more traditional ones which focus command on the authority granted to an individual, and control as a method by which authority is exercised and the technological focus of the tools available to achieve it.

The Pigeau/McCann definition works well for future C2 considerations because it does not pander to the panacea of Network Centric Warfare (NCW) theorist that often gloss over the human-factors side of C2. David Alberts goes further to distinguish between italicized *Command and Control* - synonymous with the way traditional military organizations achieve Command and Control – and a more open-ended C2 definition which focuses on effects to be achieved, very similar to Pigeau/McCann model.

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[3] David S. Alberts and Richard E. Hayes, "Understanding Command and Control", DoD Command and Control Research Program, (2006): viii; http://www.dodccrp.org/files/Alberts_UC2.pdf; Internet; accessed 01 March 2009.

[4] Dr. Ross Pigeau and Carol McCann, "Re-conceptualizing Command and Control," Canadian Military Journal, (Spring 2002), 56.

Command and Control, Alberts asserts, has become "a significant impediment to progress."[5] Therefore, the reader is encouraged to break from the traditional *Command and Control*, or Command and Control definitions and constructs, and consider a more generic, open-ended Command and Control (not italicized) that will allow paradigmatic thought patterns to be broken.

The focus of this paper is on C2 at the operational level. The operational level is defined as "…the level at which campaigns and major operations are planned, conducted and sustained to accomplish strategic objectives within theatres or areas of operations."[6] There is neither the space nor scope to consider more complex C2 problems such as coalition operations.[7] The problems of coalition C2 are at the strategic level, many of which are outside the control of the operational level commander from any participating nation. Coalitions - made up of heterogeneous military, civilian, international, and private entities – often do not even meet the basic premise of unity of command, nor do they fit neatly into the strategic, operational or tactical level.[8] For the purpose of this paper, coalitions will be considered a political hybrid with unique circumstances unto themselves and excluded from discussion.

The method of analysis herein is chronological. Alvin and Heidi Toffler argue that the history of the world can be divided into three waves. The agricultural era is the first wave and is represented by the hoe. The industrial era is the second wave and is

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[5] David S. Alberts, "The Future of C2," *The International C2 Journal*, Vol. 1, No. 1, available at http://www.dodccrp.org/files/IC2J_v1n1_01_Alberts.pdf; Internet; accessed 15 March 2009.

[6] Canada, Department of National Defence, *Canadian Forces Operations*, 1-5.

[7] Paul T. Mitchell's book *Network Centric Warfare and Coalition Operations – The New Military Operating System* addresses this specific issue.

[8] Alberts, "The Future of C2…,"5.

represented by the assembly line. The third wave is the post-industrial era or information age and is represented by the computer. One can analyze the revolutions in military affairs (RMAs) that have occurred in each of these waves, as a means of informing the discussion. The first wave was long ago, and was instrumental in effecting change through to the second wave. For the purpose of this paper, the first wave of the agricultural era will not be considered.

Chapter Two will look at past conflicts as prologue to contemporary C2 theory. The second wave (industrial era) will be the focus of the historical analysis for two reasons. Firstly, it is necessary to discuss the second wave in general, and military conflict specifically, to understand the legacy of hierarchy that is so central to this wave and the discussion in subsequent chapters. Secondly, it will be useful to analyse past conflicts where military culture and, by extension doctrine of C2 or the application of it on the battlefield have contributed to both success and failure. Chapter two will analyze events starting with the Franco-Prussian wars in 1806 and end with the development of *blitzkrieg* in World War II. Covering a period across two centuries, it is not within the scope of this paper to analyze all of the events that have had a profound impact on contemporary theory. A broader analysis of this issue would have also included those periods prior to 1806, 'Moltke the Elder' (circa 1870), and the development of Russian operational art as a minimum.

Chapter Three discusses contemporary theory. Toffler asserts that we are moving from the second to the third wave today; that various elements of society have moved into the Third Wave (post-industrial) while other elements are still in the Second Wave. This transition period will be discussed as a Revolution in Military Affairs

(RMA). More specifically, Chapter Three will look at Network Centric Warfare (NCW), one of the more popular emerging concepts that have an impact on future C2 of the Canadian Forces. Many of the theorists discussed in this chapter stem from different backgrounds, be it organizational theory, cognitive behaviour, sociology, or defence studies. Interestingly, these theorists are all contributing to the growing body of knowledge surrounding C2 from their own respective disciplines. The key point from this is that C2 is a multi-disciplinary, multi-faceted, complex, and inherently human problem. By examining their research and findings, a wealth of principles and warnings for the future will emerge that will assist in building recommendations for the future C2 organizations of the Canadian Forces. Some of these principles will point towards a growing call to drop hierarchy as a solution to a problem that is disappearing. Others will reinforce, through empirical data, that new forms of organization, including flatter architectures or 'edge' organizations, can move information and provide better decision making than hierarchies. The common theme throughout is that the ongoing RMA provides new opportunities to improve, innovate, and adapt in ways that we can yet imagine. Examining the possibilities will, as a minimum, challenge any traditional military thinkers that a hierarchical approach to C2, and always will be, the best solution for the future of the CR.

Chapter 4 will look specifically at C2 in the CF today, and where it needs to be in the future. The method used in chapter 4 will be to apply a three-dimensional C2 model from chapter 3 to ascertain the optimum C2 structure for the future of CF operations. The analysis will reveal a complex and uncertain future security environment which will point towards C2 structures that are flatter and more agile. This will represent the culminating

point of the chapter. The chapter will conclude by looking at CF transform and implications on C2, where its policies are leading, and then look at the cultural and leadership issues that will help or hinder the CF in achieving the necessary transformation.

The method chosen for this paper is meant to be simple. First, look at the past which informed the development of contemporary theory and identify relevant lessons learned. Second, analyze contemporary theory and define a model for matching the optimum C2 solution to a given problem. Third, analyze the future and apply the model to discover the optimum solution. Finally, discuss where the CF is today, and recommend what might help on the road to achieving the optimum solution.

CHAPTER 2 – THE PAST AS PROLOGUE

Williamson Murray asks how analysts of revolutions in military affairs make sense of the past. He answers this question by portraying the past as non-linear, meaning that it cannot provide direct cause-effect, but only more questions or possibilities. In paraphrasing Clausewitz, Murray points out that history can "sharpen our judgment about the nature of war and about the sort of organizational behaviour that can encourage effective innovation.[9] The focus of this chapter will be to identify those 'behaviours' from past conflicts that have contributed to success or failure, and therefore contribute to shaping contemporary C2 Theory.

The behaviour, in large, will be that of the commanders and the framework within which they work; reinforcing Pigeau/McCann's assertion that command is a human endeavour of 'creative expression'. As this chapter will discuss, this expression has its greatest impact in the decisions that commanders make (or fail to make) given the circumstances and information available at the time. It is important to note that by analyzing past conflicts, we are also discovering those behaviours or agents of change that best prepared commanders for their own uncertain futures, much as we must do ourselves in preparing for tomorrow. If we accept that the only certainty is change, then an analysis of those lessons from the past can only assist us in preparing for the future. However, Command is affected by too many factors to be able to use military history as

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[9]Williamson Murray, "May 1940: Contingency and fragility of the German RMA," in *The dynamics of Military Revolution* (New York: Cambridge University Press, 2001) 157.

evidence of any immutable principles.[10] Regardless, there will be common themes emerging that will inform the discussion in subsequent chapters.

The practice of C2 throughout history has varied for different reasons, whether through necessity, culture or brilliant innovation. The experience of Canadian Officers as part of the Canadian Expeditionary Force of World War I applied old principles and developed new ones that we could see in the C2 of Canadian Forces in Afghanistan today. However, choosing a method of C2 because that is the way it has always been done (implying cultural or historic ties) does not provide sound logic. There were often good reason for doing things a certain way in the past. If those reasons no longer exist, then the practice associated with it falls into question. This is often why service cultures and traditions can become one of the main obstacles to establishing credible cause-effect relationships when looking at various approaches to C2. This is likely because effective innovation does not stem from traditional practices. Rather than using history to justify existing traditions, it should be used as a retrospective concept development and experimentation laboratory that can identify principles and provide insight into the applicability of certain theories.

In discussing Toffler's Second Wave – the industrial era – one cannot escape the prevalence of hierarchy and bureaucracy as an enduring theme. Hierarchy had an important role in the move from agricultural to industrial societies. In the 1800s, a society that relied more on less-educated farmers and immigrants moving into cities and working in factories required "…clear lines of authority and responsibility, and copious rules, regulations, policies, and procedures…" that were "…well suited to regularizing

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[10] Martin Van Creveld, *Command in War*, (Cambridge: Harvard University Press, 1985), 261.

the behaviour of these workers."[11] In other words, society was changing its doctrine of organization and interaction in response to the emerging technological advances of the industrial age. Similarly, the industrial era changed the way war was waged as well.[12] It was the French Revolution and the subsequent Napoleonic era that would see the whole people (rather than conscripts) "now enlisted in the war effort via the *levée en masse*…"[13] or total war.

Total war meant that society as a whole was engaged in the war effort; a change from the traditional smaller professional armies which served the monarchies. This in turn produced larger armies than ever before. The challenge then became, how do you exert control over forces that are increasing in size? The French solution, Citino asserts, was the development of command echelons "…above the level of the regiment, divisions for the revolutionary armies and corps for the Napoleonic." [14] An examination of this important era (Napoleonic) in military C2 will reveal the 'behaviours' that contributed to success or failure on operations. These new behaviours began to take shape in Western Europe within a new level of war that served to translate national strategic aims into tactical objectives. As history would later prove, it would be the Prussian Field Marshall Helmuth von Moltke who would formalize this operational art into doctrine.[15]

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[11] David K. Banner, and T. Elaine Gagné, *Designing Effective Organizations: Traditional & Transformational Views*, 10; available at http://books.google.ca/books?id=RVjyaVvEGHoC&printsec=frontcover; Internet, accessed 14 April 2009.

[12] Martin Van Creveld, *The Culture of War*, (New York: Ballantine Books, 2008), 147.

[13] Robert M. Citino, *The German Way of War: From the Thirty Years' War to the Third Reich*, (University Press of Kansas, 2005), 105.

[14] *Ibid*., 107.

[15] Michael D. Krause and R. Cody Phillips, *Historical Perspectives of the Operational Art*, available at http://www.history.army.mil/books/OpArt/; Internet, accessed 15 April 2009.

Franco-Prussian Wars of 1806 and 1813

The first 19th century Franco-Prussian Wars provide excellent historical evidence to demonstrate changes in organization, doctrine, and culture that can affect C2. It is also important to note that, except for the Chappe telegraph, this period of change did not include any technological advances.[16] The first area examined will be the Napoleonic staff and the divisions and corps he fielded against Prussia. The second half of this examination will look at Prussia in the inter-war period (1806-1813) and the changes brought about that manifested themselves in allied victory over Napoleon in 1813. The question to be answered is, what role did doctrine, culture, and organization play during these battles, and were they a decisive factor in either victory or defeat?

In 1806, Prussia's problems lay largely with many of their older commanders who were indifferent to, or unaware of French military developments of the previous two decades, despite some calls for reform from younger officers.[17] This culture of resistance to change meant that the Prussian army did not share in the innovations that Napoleon's new Corps and their requisite staff brought to the battlefield. In contrast to the Prussian Army, the French Revolution had opened up a new military culture where troops fought as free men and their officer corps brought the "career open to talent" in place of the old aristocracy just a decade earlier.[18] One of these young lieutenants was Napoleon himself. What Prussia would discover the hard way was that the French could deploy and control

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[16] Van Creveld, *Command in War…*, 62.

[17] Citino, *The German Way of…*, 110.

[18] MacGregor Knox and Williamson Murray. *The Dynamics of Military Revolution: 1300-2050*. (New York: Cambridge University Press, 2001), 65-66. Knox reports that in the fervour of the revolution, France executed seventeen generals in 1793, and sixty-seven in 1794. By the summer of 1794, almost half of the officer corps had not served under the old regime.

eight independent all-arms corps, each with its own staff in a common structure[19] (hence the term Napoleonic staff). In theory, these changes offered operational advantages. Divisions could operate across a larger area due to their independence and enhanced security. This distribution over a larger frontage also meant that "…an opposing unitary army could be easily enveloped…"[20] among other things.[21] Thus while the Prussians were still moving at best ten to twelve miles per day, the *Grande Armée* could move larger forces twenty.[22]

It would be easy to attribute French victory in 1806 simply to the creation of Divisions and Corps; however, there are many other factors on both sides that contributed to the Prussian defeat. Firstly, the character of the commanders themselves had a definite impact. It has even been suggested that this new operational level of war under anyone other than Napoleon would have failed; that the revolution was a product of "…one of those rare explosions of human energy which, like supernovae, sometimes light up the course of history."[23] Looking back to the definition of C2, the personal attributes of the commander here appear to be as decisive as the system used to establish control. With *le feu sacre*, Napoleon not only led the military revolution, he bred a form of nationalism

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[19] Van Creveld, *Command in War…*, 60.

[20] Claus Telp, *The Evolution of Operational Art, 1740-181,* (London; New York: Frank Cass, 2005), 42.

[21] Claus Telp goes further to say that Napoleon's Corps and Divisions also had the advantage of higher speed of movement, greater combinations of 'less predictable' manoeuvre, more secure lines of communication, and greater reconnaissance.

[22] Citino, *The German Way of…*, 110.

[23] Van Creveld, *Command in War…*, 62.

that was as important to raising, motivating, and committing forces as any organizational or technological advances.[24]

The framework within which Napoleon and Frederick William waged war are as important as their personalities. Napoleon served all of the functions of ruler, down through the strategic and operational military levels. Therefore, when Napoleon made a decision at the political level with operational military implications, there was little need to establish consensus across multiple levels of command. This also holds true for the situational awareness Napoleon enjoyed through the many hats he wore. A report of enemy troop movements or dispositions of own forces to Napoleon would satisfy both the operational, strategic and political level at the same time. He accomplished this through a strong, centralized control which was established for the purpose of war.[25] In contrast, Frederick William ruled a kingdom of political hangers-on and advisers that resulted in "…a lack of policy coordination particularly between diplomacy and military planning, and a lacklustre mobilization."[26] Thus, even though Prussia had declared war on France and had the initiative, it was Napoleon that was able to act first.[27]

The short period after Prussian defeat in 1806 that led to the battles of 1813 can be described as transformational for the Prussian Army. Reformers such as Gerhard von Scharnhorst and Carl von Clausewitz among others developed two main solutions to the problem they faced in Napoleon. These two solutions were to develop "…thinking

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[24] MacGregor Knox and Williamson Murray. *The Dynamics of Military Revolution: 1300-2050*. (New York: Cambridge University Press, 2001), 68.

[25] Telp, *The Evolution of Operational Art…*, 63. Further information regarding the workings of Napoleon's 'whole of government' approach to war can be found at http://www.history.army.mil/books/OpArt/france1.htm.

[26] Telp, *The Evolution of Operational Art…*, 63.

[27] Citino, *The German Way of…*, 113.

combatants that only universal military service could provide, and a thinking officer corps and staff system honed by *Bildung* – systematic professional study and the cultivation of decision-making skill."[28] The long term result of this approach was the creation of a staff that could serve as a "…central nervous system for strategic planning and operational control that would harness the collective wisdom of the best minds the army could recruit."[29] Here we see evidence of a culture of learning established in the Prussian army that could better serve C2 and, alongside any technological or organizational changes, at least attempt to match the level of professionalism in the military culture that had been demonstrated by Napoleon.

Napoleon was defeated in 1813 by a coalition of allies including Prussia. The results of this battle, again, cannot be attributed solely to the presence or absence of some organization or C2 structure. It had as much to do with a Napoleon's over-confidence, and a French military system with a tendency to outgrow its own C2 capabilities.[30] The defeat in 1813 was the first example of "…a problem that would increasingly bedevil military operations in the nineteenth century."[31] The previously manageable armies of seventy-five thousand had now grown to half a million. It seems, Napoleon had allowed overconfidence (or ill health) to affect the span of command[32] he was willing to accept,

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[28] MacGregor Knox and Williamson Murray, *The Dynamics of Military Revolution: 1300-2050*, (Cambridge: Cambridge University Press, 2001), 70.

[29] *Ibid.*, 72.

[30] Dennis E. Showalter, "The Prusso-German RMA, 1840-1871," in *The Dynamics of Military Revolution: 1300-2050*, ed. MacGregor Knox and Williamson Murray, (Cambridge: Cambridge University Press, 2001), 94.

[31] Citino, *The German Way of…*, 135.

[32] Jack Thakray defines span of command as "…the number of subordinate organisations given to one commander to command directly." from "The Commander-Centric Approach to Modernising

placing himself in a situation where "… [N]o single commander, no matter how gifted, could possibly process all the possibilities and potential combinations of that many men and that many corps."[33]

To summarize this section, we need to answer what role doctrine, culture, and organization played during the 1803-1813 era of Franco-Prussian Wars, especially as it pertained to C2. The culture that emerged from industrialism and the revolution produced larger armies which, under the innovation of the French and later the Prussians gave birth to the operational level of war and operational art. The innovations (corps, divisions, and staff) of this era in themselves however, were insufficient to guarantee victory. Evidence from both the Prussian and French side has demonstrated that command competence, organization, societal motivations, military culture, are all inter-related and impact the effectiveness of a C2 system. Therefore no one factor on its own is decisive. What is decisive, however, is the understanding of culture and the matching of commander to a control system against a given foe that provides a distinct advantage. It was seen to work for Napoleon in 1806 (intentional or otherwise), and worked against him after 1813.

Napoleon should be remembered as a leader who was able to change organizational and procedural doctrine (if doctrine existed then) in order to overcome the limits of existing technology.[34] Despite the growing mass of his forces, he did not possess any new invention capable of passing information or achieving situational awareness at the operational level than his recent predecessors. He had to rely on the

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Command Structures," in *The Big Issue: Command and Control in the Information Age*, ed. David Potts (UK, Strategic and Combat Studies Institute, 2002),

[33] Citino, *The German Way of…*, 135.

[34] Van Creveld, *Command in War…*, 191.

same method of signals, messages passed by rider and horse, or word of mouth. Napoleon's example lends evidence to the theory that organizational and doctrinal changes are an effective means of responding to technological improvements, or in the case of Napoleon, technological limits.

The Prussians and then German army would continue to develop their culture of war over the next century and a half, which would take more space to further analyze than is available. However, Martin Van Creveld succinctly describes this period for the German army as follows:

> Partly sustained by their culture, the army, later the armed forces as a whole, were able to develop a singular combination of cohesion, strict discipline, high initiative, and the command system known as mission-type orders (*Auftragstaktik*). These qualities in turn helped the forces win a series of signal victories in the Wars of Unification of 1864-71. Later they put on an outstanding, if ultimately unsuccessful, military performance in both world wars.[35]

The German Way of War, initially developed in the 19th century, would continue to shape operational art and C2 theory throughout the 20thcentury. It is this era that is of particular importance to Canadian Military history as it represents the start of its participation in operational-level warfare.[36]

The 'Hundred Days' of World War I

Arguably, the birth of Canadian Forces C2 occurred during the First World War, which "…combined the legacies of the French and Industrial Revolutions and set the

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[35] Van Creveld, *The Culture of War…*, 363.

[36] The author acknowledges earlier conflicts within Canada (Northwest rebellion, Fenian Raids) and the Boer War as part of Canada's military history; however, they will not be considered conflict at the operational level like the First World War.

pattern for twentieth-century war."[37] This 'pattern' involves a hierarchical structure and culture of command that continues to influence C2 on the battlefield. Canada first fought as a nation during World War I.[38] Sadly, analysis of any Canadian Way of war at the operational level cannot occur within the context of both World Wars, because Canadian officers "…functioned only at the tactical level, under British commanders who may or may not have exercised operational art."[39] However, there is value in analyzing the military cultures and doctrines of both the British and the German militaries during these wars, in order to identify common themes that contributed to C2 theory.

Like the century before it, the 20th century also saw an increase in the size of armies as a consequence of increase in population and industrial capacity.[40] The new technology, in the form of telephone (and later wireless radio) could barely keep pace with size of the forces. This meant that manoeuvring "…these unwieldy infantry-dominated masses presented serious problems to staff officers weaned on lessons from the operations of Napoleon and Moltke."[41] In other words, the military doctrine at the start of the war had not fully responded to the benefits of emerging technology, and therefore the necessary changes in C2 doctrine had not yet occurred. Examples of doctrine lag also appeared in 1806, when the Prussian king ordered the formation of

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[37] MacGregor Knox and Williamson Murray, *The Dynamics of Military Revolution: 1300-2050*, (Cambridge: Cambridge University Press, 2001), 6.

[38] Pierre Berton, *Vimy*, (Toronto: McClelland and Stewart, 1986), 294.

[39] William McAndrew, "Operational Art and the Canadian Army's Way of War," in *The Operational Art: Developments in the Theories of War*, ed. B.J.C. McKercher and Michael A. Hennessy, 87-102 (London: Praeger, 1996), 87.

[40] Citino, *The German Way of War…*, 192. The opening days of WWI involved five French field armies against eight from Germany.

[41] *Ibid*., 192.

divisions to make their army like Napoleon's, but this directive was received while his army was already on the march.[42] The period from 1870 to 1914 would see a similar phenomenon of competitive emulation[43] where:

> After 1870 every European army adopted the Prussian formula. They introduced conscription, expanded their railways and telegraphs, procured magazine rifles, machine guns and quick-firing artillery…Forgetting that the Napoleonic 'revolution in military affairs' had lost its punch once every other army in Europe adopted it, these generals went to war in 1914 labouring under the 'short war illusion'; they were somehow convinced that their planning, armaments and tactics would defeat the enemy, even though the enemy possessed virtually the same technologies and doctrines that they did.[44]

Thus, Geoggrey Wawro succinctly points out behaviour of doctrine stagnation after a period of competitive emulation. The net result was an assumption of doctrinal adequacy, without considering whether or not existing organization and doctrine still provided relative strength against emerging threats, or within the context of developing technology. As we will see, it was a contributing factor to the trench warfare deadlock that ensued at the start of World War I.

There is sufficient evidence on the BEF side to suggest that culture did not allow for a flexible or innovative approach to doctrine in the early years of the war. Haig once bragged that he had fired more than 100 brigadiers.[45] As Peter Simkins points out "…the strong possibility that one might be relieved of command if one carried protests too far

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[42] Citino, *The German Way of War…*, 111.

[43]Colin S. Gray, *Strategy for Chaos: Revolutions in Military Affairs and the Evidence of History*, (London: Frank Cass, 2002), 174.

[44] Geoffrey Wawro, *Warfare and Society in Europe, 1792-1914* (London: Routledge, 2000), 225.

[45] Timothy Travers, *The Killing Ground: The British Army, the Western Front & Emergence of Modern Warfare 1900-1918*, (London: Allen & Unwin, 1987), 13.

bred caution and frequently outweighed common sense."[46] As Major-General Fuller points out, there was also the misuse of technology.

> As the general became more and more bound to his office, and, consequently, divorced from his men, he relied for contact not upon the personal factor, but upon the mechanical telegraph and telephone. They could establish contact, but they could accomplish this only by dragging subordinate commanders out of the firing line, or more often persuading them not to go into it, so that they might be at the beck and call of their superiors. In the World War nothing was more dreadful to witness than a chain of men starting with a battalion commander and ending with an army commander sitting in telephone boxes, improvised or actual, talking, talking, talking, in place of leading, leading, leading.[47]

The results of these behaviours within the BEF created a culture within which Haig and his general staff restricted operations in a way that maintained control by wire. Van Creveld posits that it was this approach that led to failure during the battle of the Somme, despite the fact that this battle was "one of the most thoroughly organized in history."[48] He further asserts that what the British High Command feared most was the sort of confusion that would make command from above difficult. Thus, troop advances were coordinated with the limited reach of the artillery at which extent they had to halt and await reorganization, regardless of the disposition of the enemy facing them. "Confusion, in a word, was to be banished from the battlefield; that this could only be done at the cost of constricting tactics to the point that the battle would be lost before it

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[46] Peter Simkins, "'Building Blocks': Aspects of Command and Control at Brigade level in the BEF's Offensive Operations, 1916-1918" Chap. VII in *Command and Control on the Western Front: The British Army's Experience 1914-18,* edited by Gary Sheffield, and Dan Todman, (Staplehurst, UK: Spellmount, 2007),159.

[47] Major-General J.F.C. Fuller, "Generalship: Its Disease and Their Cure: A Study of The Personal Factor in Command", available at http://www-cgsc.army.mil/carl/resources/csi/Fuller/Fuller.asp#Generalship%20in%20the%20World%20War; Internet, accessed 16 April 2009.

[48] Van Creveld, *Command in War…*, 158.

started nobody seems to have considered."[49] As well, early attempts at mission command were often ineffective "…because of a combination of insufficiently trained subordinate commanders, the British army's lack of a culture of mission command, and the inclination of higher commanders to interfere in operations."[50] Thus, a military culture of highly rigid control (or lack of trust) did not allow changes to organization and doctrine that would capitalize on technological advances (artillery, tanks, wireless radio).

While the 'hundred days' is the main period of analysis, Peter Simkins does point out an earlier example that demonstrate the beginnings of a more flexible command climate within the BEF. It occurred during the defence of Amiens in 24-25 April 1918, where Australia's 13th and 15th Brigades took the initiative to plan, time and conduct a defensive counter-attack; a bottom-up approach that met the approval of Division, Corps, and higher (including Haig and Rawlinson). The German offensives during the spring of 1918 ironically drew attention to the fact that the BEF did have subordinate commanders capable of making sound decisions on the spot within a more flexible command structure, albeit unintended.[51] Events like these were points along a continuum of growing trust between superiors and subordinates, evidence of the importance of professional competence as an important element in decentralizing C2.

Changes in the command philosophy of the BEF continued to decentralize during the more dynamic period of the 'hundred days' in 1918. This period represented a departure from the set-piece battle approach to trench warfare, including the beginnings

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[49] Van Creveld, *Command in War…*, 161.

[50] Gary Sheffield, "An Army Commander on the Somme: Hubert Gough" in *Command and Control on the Western Front: The British Army's Experience 1914-18*, ed. Gary Sheffield, and Dan Todman, 71-95(Staplehurst, UK: Spellmount, 2007), 83.

[51] Simkins, "'Building Blocks…," 162.

of changes to C2 that had hitherto seen little development since the US civil war.[52] Prior to the 'hundred days', the lowest level of command where battles were planned and executed was at the division level[53]. Brigadiers (Brigade Commanders) and their headquarters staff carried out coordination, support and reporting functions and had little effect during the ensuing battle other than to choose the time at which to commit their reserves. However, in the later stages of WW I, the grip on decision making at the Division level began devolving to lower levels, resulting in greater success.

The 'hundred days' offensive of August to November 1918 represented a shift towards more semi-open warfare. During this period, units gained more ground in one day than they had previously in months. This stretched existing lines of communication beyond the possible, therefore it was those Corps and Divisions that devolved decision making and exercised inter-arm coordination that seemed to have the best chances of exploiting tactical gains where they occurred. For example, in the attack at Amiens (8 August 1918), the corps set up wireless information cells and provided coordination of air and artillery support. Robert Citino describes the culmination of this combined attack succinctly:

> …after four long years of brutal trench warfare, a combined attack by Allied troops…did what had previously been thought impossible: it broke through the German defensive positions on the western front. Allied assault troops, supported by the slow-moving tanks and flimsy aircraft of the period, tore a great hole through the German lines in front of Amiens and drove through into the open country, those elusive "green fields

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[52] To be fair, many of the same lessons had been learned and applied prior to the allies on the German side during the Michael Offensive in March of 1918, but that will not be discussed here. See William R. Griffiths and Thomas E. Griess book, *The Great War*, pages 132-144.

[53] Sheffield, *C2 on the Western Front…*, 145.

> beyond" that had tantalized military planners on both sides of the conflict for so long.[54]

In contrast to the methods described earlier (move, stop, and consolidate), Amiens demonstrated inter-arm cooperation that saw "… [t]anks and infantry assaulted under the cover of a fast-moving predicted barrage and a hurricane counterbattery bombardment...loitering spotter planes protected by fighters directed friendly artillery fire…"[55] By the end of the war, many of the BEF higher commanders were becoming more comfortable with allowing "…basic tactical decisions to the man 'on the spot'."[56] The devolution of decision-making, while solving one problem, created another. The ability for the lower-level commander to exercise this increased decision-making responsibility was only as good as that commander's professional and tactical acumen. Therefore, a second principle came to light through our experiences of WW I: devolved decision-making increased professional development requirements at lower levels.

The end of World War I can be described as a watershed that introduced many new innovations to modern warfare. While many of them were tactical and/or technological in nature – artillery, tanks, rail networks, aircraft, wireless radios – it was how (or whether at all) the military culture responded and harnessed these technologies that made the difference. The increased decentralization paid off when two Australian Brigades were allowed to execute a bottom-up solution for a counter-attack. The use of headquarters staff to coordinate the supporting functions of artillery and aircraft also paid

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[54] Robert M. Citino, *The Path to Blitzkrieg: Doctrine and Training in the German Army, 1920-1939*, (Boulder, Colo: Lynne Rienner Publishers, 1999), 2.

[55] John Enlgish, "The Operational Art: Developments in the Theories of War", in *The Operational Art: Developments in the Theories of War,* ed. B.J.C. McKercher and Michael A. Hennessy, 7-27, (Westport, CT: Praeger, 1996), 12.

[56] Simkins, "'Building Blocks…," 162.

dividends in realising more fully, the potential that these improved technologies brought to the battle. Overall, it may have taken Haig and his staff several years to learn it, but the BEF during the 'hundred days' did eventually move another step closer to what we call 'mission command'; that approach which requires higher commanders to set objectives, but give subordinates the freedom to decide how to achieve them. Sadly while the successes of the 'hundred days' are fairly well documented now, they were never well institutionalized during the post-war demobilization, at least among the allies. The Germans however, possibly because of an already well-established doctrine of *auftragstaktik*, paid more attention. It was the German Army that would take the lessons seriously, and further nurture and develop advances in doctrine that would subsequently bring about the birth of *blitzkrieg* in World War II.

Blitzkrieg in World War II

The inter-war years for Germany can be characterized best as retrospective and transformational. Generals Werner von Fritsch and Ludwig Beck re-wrote *Truppenführung*, which led the Army's efforts to evolve in a "…coherent, careful, evolutionary fashion."[57] For the Germans, the lessons of 1918 had proven that auftragstaktik could open up, what the Germans accepted was an inherently chaotic battlefield.[58] This resulted in a doctrinal approach which "rested on a genuine understanding of the nature of warfare as a domain of constant transformation that was

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[57] Williamson Murray, "May 1940: Contingency and Fragility of the German RMA," in, *The dynamics of Military Revolution 1300-2050*, ed. MacGregor Knox and Williamson Murray, (New York: Cambridge University Press, 2001), 159.

[58] McAndrew, "Operational Art and the Canadian…," 91.

not subject to accurate prediction."[59] Germany's reaction to the Treaty of Versailles under Hitler stirred a nationalistic fervour and renewal of militarism. One must remember that Germany was limited by the Treaty of Versailles which restricted any open developments until at least 1935, when Hitler defiantly opened the door to rearmament.[60] A believer in short wars, Hitler set out to rebuild a German army that was aggressive (like its Prussian tradition), fully mobile, and tested in battle (the Spanish Civil War).[61] As we will see, a culture of innovation emerged that transformed the German military into a force that would quickly defeat France, and later push the allies back to Dunkirk.[62]

1930s advances in mechanization forced both Germany and the Allies to consider its use in any future war. Germany's response was the panzer division which, unlike any of the allies, was a unique solution of large units of tanks in a combined arms formation.[63] Citino points out that the panzer division did not just arise from theoretical work. He describes the long series of manoeuvres with simulated tanks from 1928, followed by the use of real ones after 1935. The last piece of the puzzle that needed to be solved in order to affect the panzer division concept was the C2 problem. It was hard enough with the mass of tanks moving about the battlefield at high velocity. Add to the mix the supporting arms and air support, and the problem must have seemed

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[59] Murray, "May 1940: Contingency…," 159.

[60] Citino, *The Path to Blitzkrieg*…, 229.

[61] Alan Shepperd, *France 1940: Blitzkrieg in the West*, (London: Osprey, 1990), 6-7.

[62] *Ibid*., 2.

[63] Citino, *The German Way of War*…, 254. Citino also describes the allied solutions of the time. The British invented the "armoured division", hundreds of tanks with little supporting arms. The French invented two formations in the "light mechanized division," and "armoured division". Italy invented the "binary division" of two regiments, which failed in combat.

insurmountable. It was in the panzer division that wireless radio came into its own. The German solution to maintain C2 was to have "…a radio in each command station and each vehicle unit, from the smallest motorcycle to the heaviest tank, with specialized command vehicles designed to carry radio equipment, both senders and receivers."[64] The word *blitzkrieg* or "lightening war," would soon be coined after the 1939 invasion of Poland, when the rest of the world witnessed the devastating effects of this new German formation. It was the years of considered theory, modelling, and experimentation during the inter-war period that led to the concept of the panzer division and ultimately *blitzkrieg*, rather than the many technological advances that precipitated its development.

William McAndrew contrasts the allied response to emerging technologies with the Germans during the inter-war period. Unlike the German army, the allies had not accepted the unpredictable nature of battle. Instead, they tried to impose more order on it through, for example, the refinement and more effective control of artillery. This resulted in a static doctrine where firepower and technology was expected to win over finesse. It also produced a level of rigid, centralized control characterized by the following:

> Higher-level staffs carefully crafted detailed plans for others to implement. Divisions, brigades, and battalions were routinely assigned limited tactical objectives, invariably a geographical feature which was usually an enemy strong point. Start lines, report lines, boundaries, and timed artillery barrages gridded the battlefield, confining tactical mobility, let alone operational maneuver [sic], and leaving unit commanders little opportunity to respond flexibly.[65]

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[64] Citino, *The German Way of War…*, 256.

[65] McAndrew, "Operational Art and the…," 91.

Viewed in isolation, it would appear that the German transformation represented a Revolution in Military Affairs over a short period of time. However, Murray succinctly points out that:

> The military culture that supported the Prusso-German approach to war had taken over a century to evolve; decrees from above cannot magically decentralize warfare. German commanders had had to learn to devolve creative freedom and authority upon their juniors – an unprecedented and largely counterintuitive step.[66]

After viewing the state of allied doctrine relative to the German's, it is not hard to imagine the relative strength with which Germany entered the war. Their culture of auftragstaktik and the development of *blitzkrieg* demonstrate the revolutionary capabilities that a culture of innovation can develop with using emerging technologies. The lesson here is that changes to doctrine occurred because the Germans had a long-standing culture of innovation; an ethos that their doctrine should be iterative in nature.

This chapter has examined the historical 'behaviours' in war that have contributed to shaping contemporary C2 Theory. The analysis of this limited set of conflicts over the past two centuries has identified many common themes that have been described as enduring or even decisive in the establishment of C2 on the battlefield. Above all, it must be remembered that the impetus for change within the period examined was Industrialism. This second wave introduced new ways of thinking about society (French revolution) which in turn brought new military doctrines such as the armies of 'free men'. It also brought a mass to armies in the field that had hitherto never been seen, with the requisite industrial capacity to sustain it over long periods. This period also brought about new technologies that, depending on a military's ability to leverage culture and

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[66] Murray, "May 1940: Contingency…," 160.

doctrine, could reap success or failure. Competitive emulation brought about parity at best, which motivated the Prussians after 1806, and also resulted in the trench deadlock of World War I. It was the cultures of innovation like the Germans in the inter-war period (WWI to WWII) that seemed best placed to look beyond achieving parity to the development of new and superior methods of operating (*auftragstaktik, blitzkrieg*).

Above all, a military's ability to react to change (new technology, enemy doctrine) came back to the commander's central role. The Franco Prussian wars of 1806 and 1813 provided evidence of the importance of the commander as central to establishing a culture of innovation. The framework within which the commander works (political and strategic) can also further help or hinder in the same way. The value of decentralizing C2 clearly provided the advantage of more flexibility and speed of execution in most of the battles analyzed, however Napoleon's lesson in 1813 also demonstrated that a balance is to be struck between mass, and the ability to maintain situational awareness and exert control.

The 'Hundred Days' also demonstrated Haig's strong influence of operational control which overshadowed any doctrinal flexibility. The misuse of field telephones to further centralize at the expense of flexibility on the battlefield was a hard lesson, as was the years of ignoring bottom-up solutions that, in the end, led the allies to break their own trench deadlock.

The Germans provided the final lesson in their development of the panzer division, thereby introducing the world to *blitzkrieg*. The relative strength that *blitzkrieg* provided to the Germans early in the war could not have developed without a long-established culture of professional development, experimentation, and innovation that

was demonstrated through the German interwar period and guided by *Truppenführung*. The jewel in the crown of transformation for the German Army was the institution of *auftragstaktik*. The most important lesson from *auftragstaktik* is that the ability for militaries to adapt to emerging trends is as much a *zeitgeist*[67] as it is an act or policy. In contemplating the future of C2 for the Canadian Forces, we would do well to remember the successes and failures of past military cultures. If we accept that the only certainty is change, then the conclusions of this chapter are a call to foster a Canadian Forces *zeitgeist* of innovation and open-mindedness best summarized by Murray and Knox:

> The claim that military institutions fail in battle because they study the last war too closely is a platitude wholly without foundation. The military institutions that successfully innovated between 1919 and 1940 without exception examined recent military events in a careful, thorough, and realistic fashion. Analysis of the past was the basis of successful innovation…Simple honesty and the free flow of ideas between superiors and subordinates – key components of all successful military cultures – were centrally important to the ability to learn from experience.[68]

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[67] The German word *zeitgeist* is defined as "the spirit of the time; general trend of thought or feeling characteristic of a particular period of time." http://dictionary.reference.com/browse/zeitgeist

[68] Williamson Murray and MacGregor Knox, "The Future Behind Us," in *The Dynamics of Military Revolution: 1300-2050*, ed. MacGregor Knox and Williamson Murray (Cambridge: Cambridge University Press, 2001), 188.

CHAPTER 3 - CONTEMPORARY THEORY

A satisfactory theory of war never conflicts with reality.

Karl von Clausewitz

Alvin Toffler contends that society at the end of the 21st century is "…the final generation of an old civilization and the first generation of a new one." He further asserts that much of the confusion today (think contemporary theory now) can be directly attributed to internal conflict, both personal and political "…between the dying Second Wave civilization and the emergent Third Wave civilization that is thundering in to take its place."[69] The treatment of contemporary theories that impact C2 should certainly be seen in the same light Alvin Toffler portrayed the transition from Second to Third Wave, confusing. It makes sense that there should be such a disparity in theories if one accepts Toffler's description of our times. The purpose of this chapter will not be to empirically prove or disprove any theories. Regardless, there is value added in at least looking at the most prominent theories that have shaped C2 structure decisions within the CF.

This Chapter will look at several theories that are necessary to build a common understanding for the discussion that follows in Chapter 4. Starting with basic C2 theory, further discussion of the Pigeau/McCann model will set the ground work upon which subsequent theories will rest. Czerwinski's approach to three type of C2 will also be a necessary discussion in framing the different styles or approaches to C2. The introduction of RMA theory will be looked at as necessary pre-cursor to Network Centric Warfare (NCW). NCW will form the nucleus of this chapter given its impact on CF policies regarding the development of Network Enabled Operations (NEOps) - a CF

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[69] Toffler, *The Third Wave…*, 12.

version of NCW. Counter-arguments and critiques of NCW will be discussed to gain a more balanced perspective followed by 'Edge' organizations - a more detailed conceptual model born out of the NCW theory. The central thesis of this chapter is that C2 theory is complex and dynamic, and that there are many ways to 'skin the cat' when it comes to selecting an appropriate C2 model for a given mission. With an understanding of the common language surrounding C2 theories and an appreciation for some of the complexities, we will be well placed to apply it all to the CF today and tomorrow; the culminating discussion in chapter 5.

The Pigeau/McCann Model

Before getting into any further discussion of C2 theory, it would be wise to review the basic framework of C2 as per the Pigeau/McCann model. Remember that Command and Control are defined as:

> **Command: "***the creative expression of human will necessary to accomplish the mission."*
>
> **Control: "***those structures and processes devised by command to enable it and to manage risk"* [70]

Pigeau and McCann assert that creativity is the most important element of Command, because it is creativity that ultimately allows humans to make sense of chaos or, in the military construct, the complexities of battle or 'fog of war'. The second element that compliments creativity is will which they define as diligent purposefulness. Pigeau McCann provides an example where reliance on control only without the creative expression of will, can remove the ability to solve problems:

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[70] Pigeau and McCann, "Re-conceptualizing Command and Control…," 56.

> The classic instance of proceduralization is the automotive assembly line with its extensive structures and processes (i.e., control) for manufacturing cars. Yet as most unions know, an effective strategy for delaying or obstructing production is work-to-rule — that is, to work only within the explicit guidelines and duties stated for the position. Work-to-rule is effective as a job action because most businesses rely on the good will of their work force to creatively solve the many minor problems for which rules and regulations have not been (and may never be) developed.[71]

Expounding on their model further, they assert that control should not be viewed in terms of an engineering model through which the outcome is compared to the goal and then action is taken to resolve the difference. They assert that control implies much more to include "…the personnel, facilities and procedures for planning, directing and co-ordinating resources in the accomplishment of the mission."[72] This is expanded further to include standard operating procedures, equipment (*including cybernetic processes*), rules of engagement, military law, and policy and regulations. Pigeau and McCann conclude their discussion on control with a warning that will also be pertinent to subsequent discussion – control comes at a price which restricts flexibility once it is imposed. This is because any adopted process or structure "…excludes from consideration an infinite set of alternative structures and processes that may suit the problem better."[73] Consequently the control process or structure put in place for one mission or situation may not work as well in another.

There are many relevant points to take away from the Pigeau/McCann model. First, the cybernetic processes (Network Centric Warfare) that we will discuss later comprise only a part of the control solution set. Secondly, the method of control

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[71] *Ibid*., 55.

[72] *Ibid*., 54.

[73] *Ibid*., 55.

established by command is mission dependent; therefore a "one size fits all" approach to any C2 model should be treated with suspicion. Lastly, the analysis of the auto-workers' ability to 'work to rule' intimates in a reverse way, the ability for subordinates to contribute to the solution space of military problems outside of the procedures and structures that are in place. Therefore, command in essence can be exercised by all ranks and is not reserved for the senior officer at the top of the organizational chart. This last point is an important aspect of subsequent discussions on Network Centric Warfare Edge organizations.

The Czerwinski Framework

The essence of the Czerwinski framework asserts that command is carried out in one of three ways: command by direction, by plan, or by influence.[74] Command-by-direction is the oldest form of C2 and is analogous to some of the methods analyzed in the Franco-Prussian Wars. It involves the commander's attachment to a decisive element of his force (or moving from one element to another) where he could both observe directly and provide decisions as the battle progressed. This method of C2 saw a renewal in the US Army's Force XXI, which sought to digitize the battlefield in a way that provided commanders with real-time synchronization.[75] The second method, command-by-direction, is a highly centralized method of C2 that seeks to impose order on a chaotic battlefield through the disciplined implementation of a comprehensive plan. Czerwinski likens this approach to the US Air Force campaign methods, whose organization and

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[74] Thomas J. Czerwinski, "Command and Control at the Crossroads," from *Parameters*, autumn 1996, pp. 121-132; http://www.carlisle.army.mil/usawc/Parameters/96autumn/czerwins.htm; Internet, accessed 20 April 2009.

[75] "Synchronization is arranging activities in time and space to mass at the decisive point." US Army, Field Manual 100-5, (Washington: HQDA, 1993), 2-8. http://www.fprado.com/armorsite/US-Field-Manuals/FM-100-5-Operations.pdf; Internet, accessed 20 April 2009.

tasks are designed to "…operate with less information in total, notwithstanding the considerable complexities in achieving targeted expectations."[76] Finally, command-by-influence is the use of *auftragstaktik* or mission-type orders that was discussed in Chapter 2. This method accepts chaos on the battlefield and seeks to manage it through more decentralized control where the commander gives his intent (the what), and subordinates are free to pursue the method to achieve it (the how).

Czerwinski's model is important to subsequent discussion here because, as he points out, certain models have traditionally been chosen by different services (Air Force, Army, and Navy). This alone will make it inherently difficult to select one C2 approach that will work in a joint environment for the CF, which begs further analysis that will be covered in the next Chapter. Before getting any further into other contemporary C2 theories, it is important to back track a little and consider the underlying developments leading up to them first, including the concept of Revolutions in Military Affairs (RMA).

Revolution in Military Affairs (RMA)

Why such an interest in C2 theory when militaries have been successfully conducting campaigns for hundreds if not thousands of years with their own well-established systems? The answer to this lies in the many discussions about the ongoing Revolution in Military Affairs (RMA). This RMA is widely held to be in response to technological advances brought about from the information age. Theories vary widely as to whether the RMA is moving linearly, or exponentially; whether we are at the beginning, middle or end. Regardless, what can be drawn from these theorists is that they all agree that something has, is, or is going to change in a way that requires attention, and

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[76] Czerwinski, "Command and Control at the Crossroads..."

that existing C2 organizations will be affected in some way. Whether you agree with any one vision of the future or not, the common thread throughout is that technological innovation requires a concurrent organizational change if there is to be any benefit from it.[77] This section will not indulge in the debate over the existence of RMAs. Instead, it will share in Colin Gray's approach to RMA "…as befits an intellectual construct, it is more or less useful rather than true or false."[78]

An RMA is defined as "…a major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military doctrine and operational and organizational concepts, fundamentally alters the character and conduct of military operations."[79] The early roots of RMA have been traced back to 1955 in a lecture given by historian Michael Roberts.[80] The issue reappeared again in the late 1970s and early 1980s through the writings of Soviet Marshal N.V. Ogarkov who, in his seminal paper of 1982[81] and subsequent works, suggested that the most advanced nations (US, Japan and Western Europe) were on the cusp of transforming conventional warfare through a "military-technical revolution".[82]

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[77] Stephen J. Blank, "Preparing for the Next War: Reflections on the Revolution in Military Affairs," in *In Athena's Camp: Preparing for Conflict in the Information Age*, (RAND Corporation, 1997), 63.

[78] Gray, *Strategy for Chaos…*, 17.

[79] Thierry Gongora and Harald von Riekhoff, *Toward a Revolution in Military Affairs?: Defense and Security at the Dawn of the Twenty-First Century*. Westport, Conn: Greenwood Press, 2000.

[80] Murray and Knox. *The Dynamics of Military Revolution…*, I.

[81] Jeffrey R. Cooper, "Another View of the Revolution in Military Affairs," in *In Athena's Camp: Preparing for Conflict in the Information Age*, ed. John Arquilla and David Ronfeldt (Santa Monica, Calif: RAND, 1997), 99-100.

[82] Thomas K. Adams, *The Army after Next*. (Stanford California: Stanford University Press, 2008), 12.

The term RMA also gained further prominence in the Pentagon through the Office of Net Assessment (ONA) and its director Andrew W. Marshall. Through further study of Ogarkov's work and the application of his theory to history, they discovered that revolutions were not just about technology. Instead Marshall broadened the concept of RMA as containing three elements: Technological innovation, Operational concept (doctrine), and Organizational adaptation.[83] In his address to the Senate Armed Services Committee in 1995, Marshall clarified that the term revolution "…is not meant to insist that the change will be rapid – indeed past revolutions have unfolded over a period of decades – but only that the change will be *profound*, that the new methods of warfare will be far more powerful than the old."[84] Thus, one of the deciding factors in qualifying an RMA is the paradigm-shift effect it has on the nature of war.

The application of RMA theory since its inception is too broad to discuss here. Suffice it to say that it has been applied and debated over events such as post-Vietnam, the Yom Kippur war (1973), post cold war, and Gulf Wars one and two, to name a few. Williamson Murray and MacGregor Knox contend that these RMA debates are at the heart of the decision of future strategy. In other words, whichever definition or RMA theoretical model a government and its military leadership subscribe to, affects the decision they make in terms of equipment purchases, doctrine, and organization.

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[83] Thomas K. Adams personal correspondence with Andew W. Marshall as cited in Adam's book, *The Army after Next.* (Stanford California: Stanford University Press, 2008), 12.

[84] Andrew W. Marshall, Prepared Statement before the Senate Armed Services Committee, subcommittee on Acquisition and Technology, 5 May 1995, p. 2. As cited in Colin S. Gray, *Strategy for Chaos: Revolutions in Military Affairs and the Evidence of History*. (London: Frank Cass: 2002), 33. [Emphasis added].

Therefore, RMAs are decided upon, and deliberately pursued to a desired end-state.[85] The implications for the Canadian Forces is that a deliberate decision is made as to whether or not it chooses to participate, and therefore pursue the equipment, doctrine, and organizational changes necessary to achieve it. The implications of these theories specific to the Canadian Forces will be discussed in greater detail in Chapter 5.

The current RMA debate had its genesis in the last decade of the 20th century. More specifically, Colin Gray points out the Gulf War in 1991 as the precipitating event that brought about the "…information-keyed RMA of the 1990s." [86] In 1995, RMA enthusiast at the US Army War College communicated their hope perfectly when the asserted that, "American combat effectiveness in the Gulf War suggested that a historic revolution in military affairs (RMA) is underway, possibly solving many of the strategic dilemmas the United States faces in the post-cold War world."[87] Within this RMA developed other key concepts such as 'transformation' and NCW that have had an impact on the way militaries look at C2.[88]

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[85] Murray, *The Dynamics of Military Revolution…, 6-14.* Murray and Knox further differentiate between 'Military Revolutions' and RMAs, where Military Revolutions are caused by cataclysmic events outside the control of the Military, forcing them to change rapidly.

[86] Gray, *Strategy for Chaos…*, 15.

[87] Steven Metz and James Kievit, "Strategy and the Revolution in Military Affairs: From Theory to Policy," available at http://www.au.af.mil/au/awc/awcgate/ssi/stratrma.pdf; Internet, accessed 19 April 2009.

[88] Allan English, Richard Gimblett and Howard Coombs, *Networked Operations and Transformation: Context and Canadian Contributions*, (McGill – Queens University Press, 2007), 14.

Network Centric Warfare (NCW)

Network Centric Warfare (NCW) has been developing as the US military solution to the information age and is defined as "…the organizing principle that guides the military's adoption of information technologies and its adaptation to these technologies."[89] NCW promises to deliver a 'system of systems' that is a more agile method of conducting operations compatible with the 'information age', leveraging the latest in technology; commercial solutions in information technology and sensors which promise increased op tempo, responsiveness, lower risk and cost, and improved combat effectiveness.[90] Admiral William Owens, one of the early RMA founders, made a pitch for a US 'system-of-systems' in February of 1996 and predicted that the RMA is inevitable, but "the speed at which we adapt to it depends on recognition of what is emerging and a willingness to embrace these changes in our policy, planning and programming decisions."[91] NCW was introduced two years later in 1998 by Cebrowski and Gartska and has become the overarching concept for how militaries are predicted to operate in the future.[92] This techno-centric solution, promulgated first within the US military, was totted as the reasons for the rapid defeat of forces in the second Gulf War and Afghanistan.

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[89] David S. Alberts, "Information Age Transformation: Getting to a 21st Century Military," available at http://www.dodccrp.org/files/Alberts_IAT.pdf; Internet, accessed 17 April 2009.

[90] David S. Alberts, John J. Garstka, and Frederick P. Stein, "Network Centric Warfare: Developing and Leveraging Information Superiority, 2nd Ed. (Revised)," 89-90; http://www.nps.edu/Academics/Centers/CEP/docs/Alberts_NCW.pdf; Internet, accessed 01 March 2009.

[91] Admiral William A. Owens, "The Emerging U.S. System-of-Systems," available at http://www.ndu.edu/inss/Strforum/SF_63/forum63.html; Internet, accessed 1 March 2009.

[92] Matthew Duncan and Marie-Eve Jobidon, "Spontaneous Role Adoption and Self-Synchronization in Edge Organizations Using the ELICIT Platrform," (Toronto: Defence Research and Development, 2009), 3.

> With a striking blend of old and new technology, operating throughout the electromagnetic spectrum and across the range of operations, from ground forces to air and sea platforms and into space, U.S. forces in both conflicts used networked information to achieve huge efficiencies in combat. The "kill chain" against enemy targets was reduced in many cases from hours to minutes, and information about the location of enemy and friendly forces was relayed and tracked just as quickly. In Afghanistan, the deployment of American ground troops was minimal; in Iraq, a force one-quarter the size of the 1991 Desert Storm coalition defeated the Iraqi regime in 21 days, with only 161 troops killed in action. In both theaters [sic], the incidence of civilian casualties and other collateral damage was minimal.[93]

Alberts contends that the net result of adopting a NCW organization is the horizontal and wide distribution of information, obviating the need for supporting staff that date back to the Napoleonic era; when information was manpower intensive to obtain, interpret, store, and disseminate. This results in a significantly reduced number of staff and command layers, resulting in a flatter architecture. He posits that some of these layers of command will be absorbed by NCW decision aids while others will be automated.[94]

NCW Critique

The recent difficulties on operations in Iraq and Afghanistan have led some to doubt the panacea that NCW claimed to be.[95] The failure of NCW to deliver the dominance over adversaries that it promised harkens back to a verbal exchange at the end of the Vietnam War. US Army Colonel Summers commented to North Vietnamese Colonel Tu, "You know, you never defeated us on the battlefield." To which Tu replied,

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[93] John Luddy, "The Challenge and Promise of Network-Centric Warfare," http://www.lexingtoninstitute.org/docs/521.pdf; Internet, accessed 19 April 2009.

[94] Alberts, "Information Age Transformation…," 41.

[95] English, Gimblett and Coombs, *Networked Operations and Transformation…*, 5.

"That may be so, but it is also irrelevant."[96] The message in this verbal exchange should have been a warning to the subsequent RMA that the US undertook. While the US loss in Vietnam also involves political and strategic failures beyond the scope of this paper, there is still a lesson at the operational level here. That lesson is that focussing on the development of superior C2 systems and weapon systems does not always guarantee a decisive victory.[97] It was a lesson that, unfortunately, western nations are re-discovering again in Iraq and Afghanistan.

One of the problems with NCW is that it creates a focus on the rewards of information without analyzing the implications of over-reliance on such network systems. Some network-centric financial firms that boast of information superiority have experienced unexpected results leading to massive economic losses. Michael Schrage provides an example in 2001, when Cisco Systems was forced to take one of the largest quarterly write downs in US corporate history. Cisco bragged often about its sophisticated tracking system with its data-driven operational controls. Their world-class information-intensive infrastructure, however contributed to inducing the poor decisions that led to the write downs. This was caused in large part by a situation where "…the presumed excellence of information systems may have invited managerial over-reliance, and that overreliance led to overconfidence. Executives may have ignored unambiguous external signals in favour of their own networked data."[98] Schrage asserts this lesson,

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[96] Phillip Carter, "Irrelevant Exuberance: Why the latest good news from Iraq doesn't matter," Available at http://www.slate.com/id/2171510/; Internet, accessed 19 April 2009.

[97] Blank, "Preparing for the Next War…," 62.

[98] Michael Schrage, "Perfect Information and Perverse Incentives: Costs and Consequences of Transformation and Transparency," 4. http://ebusiness.mit.edu/schrage/Articles/ssp-workingpaper.pdf; Internet, accessed 01 March 2009.

among others that he discussed, points out a flaw in the claims of NCW: "…having the 'right' information at the 'right' time may not lead to the 'right' decision."[99]

The ability to synchronize and adapt faster than the adversary owing to the connectivity of NCW provides a definite advantage. The focus on the simultaneity and rapid effects provided by NCW should not come at the expense of what should be the primary concern; protection of the network systems themselves. As identified by Lieutenant Colonel David Schmidtchen, NCW doctrine often "does not identify the increased fragility of the entire network as a significant risk…"[100] While experts may speak of redundancy as a method of ensuring that expected breakages and system failures do not impede operations, Schmidtchen identifies that NCW should not assume system superiority, or that a foe that does not possess equally capable NCW. In this case, the obvious fight becomes more about the defence of our own, or denial of the enemy's network rather the exploitation of the advantages these systems provide.

The prevalence and transparency of information may lead to a higher degree of accountability for commander's decisions. This higher degree of accountability and oversight may give rise to a new form of command paralysis. While the information flows quickly through all levels of command, the prevalence of conflicting information may also be used to second-guess some commanders' decisions. The faith that we place in the automated data provided by our NCW systems may lead us to miss less ambiguous signals provided by the outside, analog world. In a worst case scenario, "… failure to

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[99] *Ibid*., 5.

[100] David Schmidtchen, "Network-Centric Warfare: The Problem of Social Order," *Working Paper No. 125,* (Australia: Land Warfare Studies Centre, June 2005), 10.

minimize casualties or protect civilians may be digitally reviewed and used to politicize flawed military decisions."[101]

It is the distribution and volume of information that is seeing the greatest changes brought by NCW; the genesis of this issue is found in the long-term trends of computing hardware. Moore's Law describes the increase of computing power as growing exponentially; doubling in processing speed and memory every eighteen months.[102] Subsequently, technological and social change into the early 21st century will be driven by the ever increasing usefulness of computers to the way we live everyday life. While electronics form the main focus of many future C2 systems, there are those who would disagree with such a techno-centric approach. The danger in shifting our reliance from human systems to computer systems lies in the "semantic twist by which the responsibility for action is shifted from man to a machine" which makes us "…lose sight of the problem of cognition."[103] Heniz von Foerster describes cognition as higher mental faculties that allow human's to learn, remember, perceive, recall, and predict.[104] He argues that the anthropomorphization (the attachment of human traits to objects) of computers has led many to think that computers really have memories as humans do, and can solve problems in the same way. However, the speed at which computers operate and the vast quantities of data that they can store does not equate to human cognition.

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[101] Clay Wilson, "Network Centric Operations: Background and Oversight Issues for Congress," *CRS Report for Congress*, (Congressional Research Service: March 15, 2007), 51.

[102] Michio Kaku, *Visions: How Science will Revolutionize the 21st Century*, (New York: First Anchor Books, 1997), 14.

[103] Heinz Von Foerster, "Thoughts and Notes on Cognition," University of Illinois, available at http://grace.evergreen.edu/~arunc/texts/cybernetics/heinz/cognition.pdf; Internet; accessed 19 March 2009, 3.

[104] *Ibid*., 2.

Information superiority, as we have seen earlier, does not guarantee good decisions. Therefore, the abundance of information provided through a network and shared widely does not equate to shared situational awareness. As Alberts succinctly put it "…strictly speaking, of course there are no shared cognitions since there are no shared brains."[105] Thus, the cognition of the commander is also a key element in the exercise of C2 that must be matched with the system, or vice versa.

While there is a preponderance of NCW enthusiasts and a raft of literature singing its praises, there are those who are more cautious. Mark Mandeles, in his book *The Future of War: Organizations as Weapons*, posits that success in twenty-first century operations will rely on institutional-organizational structure of society. His main critique of NCW theory and its surrounding RMA is that discussions often ignore the role that organization plays in improving combat capability. He blames this on a love affair with technology within the US that equates increased technical performance with improved operational effectiveness. Like the title of his book, Mandeles' central thesis is that "…the key to future combat effectiveness is not technology but rather this institutional and organizational structure and its effect upon incentives to invent and innovate."[106] His argument is compelling and aims at the heart of NCW theory.

The first concern Mandeles articulates is that NCW theory references other theories (e.g. chaos theory, edge of chaos, self-synchronization) that have not been proven sufficiently to use as evidence. He is critical of David S. Alberts and his

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[105] Alberts, "Understanding Command and Control…," 171.

[106] Mark D. Mandeles, *The Future of War: Organizations as Weapons*, (Washington, DC: Potomac Books Inc., 2005), 4.

colleagues who use analogies of the sports or business world[107] (e.g. Wal-Mart, Dell Computers) without justifying the comparison by discussing the evidence required. He further suggests that the NCW enthusiasts' approach in the use of metaphors is at odds with the empirical and experimental approach that, in the past, has brought about demonstrable improvements in operational effectiveness.[108]

Mandeles does not throw the NCW argument out in the end. One of the recommendations from Mandeles' analysis of NCW is that the development of any future military system needs to progress along a methodical and empirical approach. He also articulates value in the network approach to C2, but cautions that the matching of the organizational structure to the level of decentralization is critical to making things work. In other words, a 'one size fits all' approach to command and control does not work, especially given the differing nature of the mission, capabilities and level of war (strategic, operational, and tactical) across which NCW is meant to work.[109]

David Schmidtchen would also caution against drawing overly simplistic conclusions about the value of networked organizations over hierarchies. He points out that traditional hierarchy, even in the military, have always drawn additional strength from informal networks. Hierarchies will always have a necessary role in military organizations for "…power sharing and the source for decision-making authority in areas like conflict resolution and resource allocation."[110] Networks exist within the gaps of the

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[107] Alberts, Garstka and Stein, "Network Centric Warfare…," 35.

[108] Mandeles, *The Future of War…*, 93.

[109] *Ibid*., 170.

[110] David Schmidtchen, *The Rise of the Strategic Private: Technology, Control and Change in a Network Enabled Military*, (Duntroon, A.C.T.: Land Warfare Studies, 2006), 27.

hierarchy and provide a basis for social organization. Schmidtchen does not discount the increased adaptability and agility of networked organizations, but he does caution that the same adaptive change that is of benefit to networks, can develop quickly "…without direct reference to the upper levels of the hierarchy."[111] Consequently, he contends that the price an organization pays for the adaptability that NCW offers is a type of organizational fragility.

Edge Organizations

Enter the concept of *Power to the Edge* by Alberts Hayes.[112] *Power to the Edge* addresses some of the critiques of NCW in the area of self-synchronization, relationships and the role of organization. The basic premise of the concept is described as follows:

> Power to the edge is about changing the way individuals, organizations, and systems relate to one another and work. Power to the edge involves the empowerment of individuals at the edge of an organization (where the organization interacts with its operating environment to have an impact or effect on that environment) … empowerment involves providing access to available information and expertise and the elimination of procedural constraints previously needed to deconflict elements of the force in the absence of quality information.[113]

Alberts and Hayes define the range of possible C2 systems using two different, three-dimensional models. The first is the 'approach space' and the second is the 'problem space'. Simply put, approach space lays out the variables which define any approach to, or system of C2. The problem space lays out the variables of the environment within which that C2 system must operate. The relationship between the two is simple. Wherever an organization exists in the problem space, the corresponding position in the

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[111] *Ibid*., 43.

[112] David S. Alberts and Richard E. Hayes, "Power to the Edge: Command…Control…in the Information Age," http://www.dodccrp.org/files/Alberts_Power.pdf; Internet, accessed 15 March 2009.

[113] *Ibid*., 5.

approach space provides a C2 solution that works best. By relating these two spaces, Alberts and Hayes have qualified the dynamics our approach to C2 (approach space) and its interaction with the environment (problem space).

Looking closer at the approach space, there is a three-dimensional representation of the variables within a C2 system that a commander has to consider in establishing control. These three inter-related variables are decision rights, information dissemination, and patterns of interactions (see Figure 1).[114] Decision rights describe the

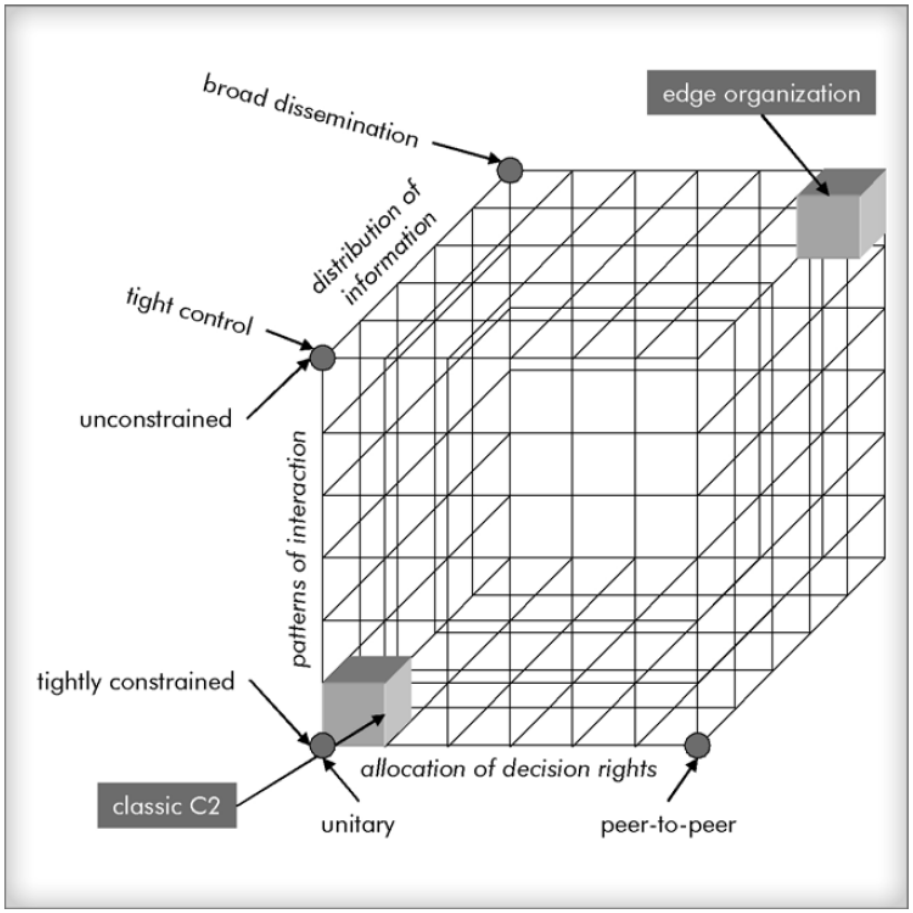

Figure 1 – The C2 Approach Space
Source: Alberts and Hayes, "Understanding Command and Control"

[114] Alberts, "The Future of C2…," 8.

assignment of responsibility for choices. This could be represented as commander's intent from a single person, and run the gambit to a form of democratic decision making in a group. Information dissemination describes the method, origin and destination of information and could be from one person to another, or broadcast widely to all members of a network (and everything in between). Patterns of interaction are types of professional/social relationship between individual members and/or organizations and could be represented by the traditional top-down hierarchy or a more open form of distributed or networked structure.

Traditional military C2 is represented in this model as having tightly constrained interactions, tightly controlled information dissemination and unitary decision rights. The bottom left position might represent the type of C2 that existed at the beginning of WW I. Haig's early use of field telephones within the BEF to constrict movements on the battlefield is an example of this approach to C2. Plotting the variables from this example on Figure 1: the interactions were tightly constrained from the top-down (fully hierarchical), decisions for subsequent exploitations were tightly held with the BEF which stifled any initiative (unitary decision rights), and passage of information went vertically rather than horizontally(tight control of information dissemination). At the other end of the spectrum from the classic C2 structure, edge organizations are characterized by broad dissemination of information, unconstrained patterns of interaction, and peer-to-peer type (collaborative) decision rights.

As discussed throughout this paper, a specific C2 solution for one mission, situation, or organization might not work for another. The question then becomes, where do you place an organization within the three-dimensional approach space when

considering C2? Alberts and Hayes say it depends on the problem (or mission) you are trying to solve. They define the problem using a second, three-dimensional model called the 'problem space' (Figure 2).

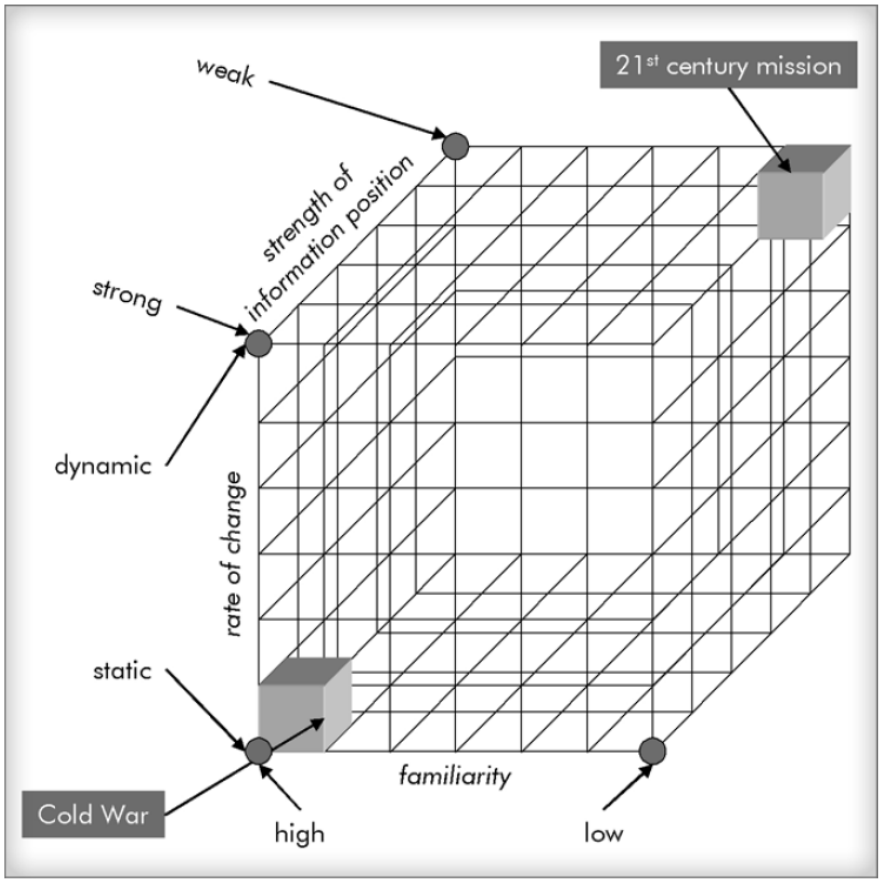

Figure 2 – The C2 Problem Space
Source: Alberts and Hayes, "Understanding Command and Control"

Problem space is comprised of three variables: rate of change (static versus dynamic), degree of familiarity (known versus unknown), and strength of information position (informed versus uninformed).[115] A static rate of change could be compared to the trenches of World War One, where the component parts of the situation (e.g. front lines, enemy methods) change little over time. Dynamic problems involve rapid

[115] Alberts and Hayes, "The Future of Command and Control…," 77.

situational changes – "…the location of critical times and places during the struggle change quickly, the operating environment is unstable, and the parties to the conflict innovate frequently and rapidly."[116] Degree of familiarity refers to how well the nature of the problem is known, or the certainty with which certain things can be predicted. Strength of information position describes the degree to which an organization can fulfill its information requirements. In other words, an insurgent organization may have all of their relatively simple information requirements fulfilled, placing them in a position of information strength. The modern military attempting to fight the insurgency may have vastly larger information requirements that are less easily met, leaving them in a weaker position. A strong position of information (not to be mistaken with amount of information) allows organizations to devolve decision rights, and also allows a more broad distribution of the information as well, given its accuracy and timeliness.

The value of Alberts and Hayes' analysis of the approach and problem space is that it allows for a qualitative discussion on discussion of both traditional C2 and edge organization at the same time. The theory provided so far has been theoretical, and the debate between the agility of hierarchical structures and edge-like (networked) structures has not been proven. However, there is a growing body of empirical study that is comparing traditional hierarchical approaches to C2 with more networked forms such as edge organizations. Numerous studies have compared the interaction of personnel in hierarchies and networked organizations. More recently, the US Department of Defence and the Canadian Forces have been sponsoring research in this area with interesting results. In 2007, the US Naval Postgraduate School concluded a study that provided

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[116] Alberts and Hayes, "The Future of Command and Control…" 78.

empirical evidence which demonstrated that Edge organizations are more agile, and therefore outperform traditional hierarchies across "abrupt environmental shifts."[117]

This chapter has looked at the complexities of C2 theory and some of the emerging trends surrounding the RMA. Pigeau/McCann reminded us that only humans command and it is the creative will that imposes itself in the choice of control methods. The analysis of human will as essential to command expanded the perception of command to include everyone. Everyone has the capacity to exercise command, regardless of the structures in place. The concept that those outside established C2 structures can contribute to the overall effectiveness of the organization (auto workers analogy) was further supported by David Schmidtchen, who provided a balanced view of the importance of social networks that operate within the spaces of hierarchies. The value of hierarchy and network came to the fore several times during competing arguments surround NCW and edge organizations. The central point from this is that 'one size fits all' does not work in the realm of C2.

Czerwinski's models gave further definition to the styles of command: by plan, by direction and by influence. These definitions were useful in pointing out that elements within a joint force (air, army, and navy) have taken culturally different approaches to C2. Czerwinski's model also reminded us that *auftragstaktik* is alive and well today in the form of command-by-influence, the model he posits operates best in situations where chaos is prevalent; a useful concept that will be pertinent to the next chapter.

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[117] Tara A. Leweling and Dr. Mark E. Nissen, "Hypothesis Testing of Edge Organizations: Laboratory Experimentation using the ELICIT Multiplayer Intelligence Game," *(June 2007)*, 4; available at http://www.dodccrp.org/events/12th_ICCRTS/CD/html/papers/017.pdf; internet; accessed 01 March 2009.

An analysis of RMA theory put the NCW argument within a context that the ongoing push for NCW in the US is a choice that is widely debated, and not inevitable. An analysis of the promises of and counter-arguments to NCW provide a more balanced view of this theory. NCW promises to deliver a 'system-of-systems' that can deliver fully synchronized, agile, joint forces with rapid and decisive effects across the full spectrum of conflict. This theory has shown early signs of promise, debatably, in the decisive operational battles in Iraq and Afghanistan. Does this same RMA imply a decision for Canada as well? If Canada does not subscribe to the information RMA, will it slide into obscurity as a relevant and capable force? Is the argument as polarized for Canada as it is in the US?

Lastly, an analysis of Alberts and Hayes approach and solution space pointed out that as problems change, so do the ideal solutions from a C2 perspective. Mandeles' critique of NCW also complimented our understanding of Alberta and Hayes approach and solution space in that he described how organizational structure can hinder or help performance. This last lesson will be critical in the next chapter where the CF is looked at specifically using all of the lessons from the past and contemporary theory discussed thus far. Given that the CF conducts military operations where consequences of error are high, "the appropriateness of an organizational structure to its task environment should be a matter of a continual empirical review."[118] This will be the focus of the next chapter that, to use Mandele's terms, will answer the following question: What will the task environment look like for the CF, and what are the optimum organizational structures decisions (C2) that will enhance its performance to meet these challenges?

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[118] Mandeles, *The Future of War…*, 97.

CHAPTER 4 – CF COMMAND AND CONTROL

> If I always appear prepared, it is because before entering on an undertaking, I have meditated for long and have foreseen what may occur. It is not genius which reveals to me suddenly and secretly what I should do in circumstances unexpected by others, it is thought and meditation.
>
> -Napoleon Bonaparte, 1812

The above quote is sage advice from a leader who, as we saw in chapter 2, was at the forefront of an RMA. Like Napoleon, in order to discuss where the CF should be going in terms of C2, thought and meditation must be applied to what the future will look like. Wherever possible, references to Canadian Forces doctrine, research, and writings have been used in this chapter. However the majority of the C2 concepts discussed in the previous chapter were developed outside of the CF. If they do exist at any level, it is within CF land forces.[119] This makes it difficult to find distinctively joint and operational literature within the Canadian Forces.

The purpose of this chapter is to complete the central argument of this paper: the future C2 structures in the Canadian Forces will need to move away from a hierarchical structure to a flatter, more agile one. This will be accomplished by drawing together the lessons from history and an understanding of contemporary C2 theory and applying them specifically to the CF. The argument that follows will consider the CF and the strategic context in which it expects to operate. This is comprised of two parts: the future security environment (FSE), and what the CF has been asked to do (expectations) within this environment. This analysis should provide a description of what will closely parallel the

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[119] Allan English, *Operational Art: Canadian Perspectives*, (Kingston, ON: Canadian Defence Academy Press, 2005), 2.

C2 'problem space' discussed in the previous chapter. The culminating point will draw everything together to demonstrate that a flatter more agile C2 structure is best suited for the future of the CF. This will be accomplished by comparing the 'problem space' from earlier analysis, and transposing it onto the C2 'approach space'. Finally, a look at where the CF is today in terms of its own transformation will allow some considerations for the changes that need to occur in order to get from where the CF is now to where its needs to be in the future. While the central thesis points to organizational change, it is not possible to effectively change an organization without changes in other areas such as technology, ideas, and people.[120] While there is insufficient scope to address all of these other issues fully, they will be touched on which, hopefully will spark further debate and research in these other areas.

Expectations for the CF

In order to understand where the CF needs to go in terms of operational C2, we must first examine those aspects of the strategic framework that affect the future of C2. One of the most important questions to address is: what has the CF been asked to do in the future? The *Canada First Defence Strategy* (CFDS) "…puts forward clear roles and missions for the armed forces, outlining a level of ambition that will enable them to protect Canadians from the variety of threats and challenges they may face in the years to come."[121] This policy directs the CF to be ready for any possible mission (peacekeeping,

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[120] Schmidtchen, *The Rise of the Strategic Private…*, 11. Schmidtchen uses the analogy of four horsemen to describe technology, ideas, people and organizations. He asserts that these four elements are essential ingredients in managing the transition from an industrial-age to an information-age military. They must be synchronized like a cavalry charge; "…the four horsemen must move to the gallop in unison, coordinating their movements over time and space."

[121] Canada, *Canada First Defence Strategy*, http://www.forces.gc.ca/site/focus/first-premier/June18_0910_CFDS_english_low-res.pdf.

disaster relief, conflict) within every possible framework (domestic, coalition, or stand-alone) at home and abroad. Essentially, the CF is asked to be ready for anything. The Canada First Defence strategy, while largely applauded for its twenty-year funding framework and prioritization of defence tasks, provides very little rationale for the plan in terms of the future security environment. The document has been described by some defence experts as truncated in its "…assessment of the current and future strategic environment, military technological and doctrinal trends, force structure, personnel issues…"[122] Thus, the plan that has been committed to over a twenty-year horizon has been largely reactionary to circumstances at the time, rather than the result of academic rigor, operational research, and development and experimentation. While the Canada First Defence Strategy may not provide the clarity required to assess the FSE, it does point out the importance of the CF's interoperability with its allies, especially the US. Therefore, an analysis of NATO doctrine and other academic writings will provide the grounding for what the future will look like, so that we can reasonably guess where the CF will fit within the 'problem space' of the future.

[122] Martin Shadwick, "The Canada First Defence Strategy," *Canadian Military Journal*, Vol. 9, No. 2. 112.

The Future Security Environment

NATO countries commonly use the term Future Security Environment (FSE) to describe the way they expect the world to look in the future.[123] While its focus is strategic in nature, it does include an analysis of future warfare, and what allies can expect in terms of the future battle space. By looking at the future security environment – the nature of conflict as an element of future societies – common themes will emerge that have an impact on C2 for the CF. The end of the cold War is one event that prompted changes in the FSE. The rise of US hegemony and the lack of a foreseeable peer competitor mean that any adversary to the US cannot win using conventional means. Paul Mitchell refers to US military primacy as a 'command of the commons'.[124] The 'commons' he defines as "…those areas over which there is no national jurisdiction (most obviously, the sea and outer space) and those areas where military control is difficult to enforce."[125] The significance of US 'command of the commons' for Mitchell, is that it provides the US an unmatched global capability, effectively organised within its Unified Command Plan (UCP). This US global military dominance is living up to Alvin and Heidi Toffler's third wave vision of future warfare: "the real-time coordination of numerous weapons over great distances, creating an unprecedented combat capability – something that has been unimaginable prior to the emergence of information age

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[123] North Atlantic Treaty Organization (NATO), "Future Security Environment," (FSE) 13 June 2007: http://www.act.nato.int/multiplefutures/ACTFutureSecurityEnvironmentFirstEdition.pdf; Internet, accessed 01 March 2009.

[124] Mitchell, Paul T. *Network Centric Warfare and Coalition Operations – The New Military Operating System,* (New York, NY: Routledge, 2009), 18.

[125] *Ibid*., 18.

technology."[126] The lack of a peer competitor to the US has driven adversaries down unconventional roads and will continue to do so for the foreseeable future. This shifts where the CF can expect to operate on the three-dimensional 'problem space' model from the Cold War region towards the 21st century mission. What are 21st century missions and how are they defined?

The Tofflers warn that what form future conflict takes, who the adversary is, and under what conditions these conflicts are played out is only limited to imagination. However the inability to know with certainty the 5Ws of future warfare has not prevented a plethora of theoretical writings on the subject. Bernd Horn describes the future battlespace as "…volatile, uncertain, constantly changing, and ambiguous."[127] He further points out that the nature of the enemy will force militaries to operate in smaller, more agile and widely dispersed units, causing greater reliance on networked technology to maintain situational awareness. Conflict will become more complex, not just because of the growing asymmetry of threats, but also because of the ever-growing scrutiny of media coverage at all levels. In order to function within the daunting environment described by Horn, militaries will require a "…reorientation of how we think and operate on the battlefield."[128] He concludes that what will be required are "…adaptable (highly trained

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[126] David Potts, The Big Issue: "Command and Combat in the Information Age," DoD Command and Control Research Program, (2002): 9; http://www.dodccrp.org/files/Potts_Big_Issue.pdf; Internet; accessed 01 February 2009.

[127] Bernd Horn, "Complexity Square: Operating in the Future Battlespace," http://www.journal.forces.gc.ca/vo4/no3/command-ordre-eng.asp; Internet, accessed 01 March 2009.

[128] *Ibid*., 14.

and educated), highly mobile, well-equipped forces capable of rapid deployment on complex multi-dimensional coalition operations…"[129]

NATO FSE

In its introductory remarks, the NATO FSE document asserts that predicting the future is "…an impossible and fanciful nonsense. That said, it would also be irresponsible not to look at current trends and their drivers and then logically ask the "So what" or "What next" questions."[130] NATO has devoted effort in keeping its own version of the FSE updated. The most recent version (2007) delivered insights into the future of operations for NATO countries. One of these insights is that the future is characterized by easily accessible technology that will enable a determined enemy to attack, creating vulnerabilities in unexpected ways. They conclude the insight by asking NATO allies to consider changes in their operating concepts, capabilities, and future force structures in response to this.[131] The NATO FSE also identifies a growing need for militaries to operate in a less conventional manner. Specifically, it identifies 'other than military threats' as providing the biggest challenge; one that will increasingly require militaries to operate in non-traditional areas. "Global challenges will require comprehensive global solutions to combat elusive, non-state foes. Seamless integration with other international organisations such as the United Nations, regional alliances, and non-governmental

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[129] *Ibid*., 14.

[130] NATO, "Future Security Environment…," 10.

[131] NATO, "The Multiple Futures Project: Interim Report on Security Implications" (released 18 Dec 2008), available at http://www.act.nato.int/multiplefutures/081212%20-%20MFP%20Interim%20Report%20-%20Final%20Version.pdf; Internet, accessed 15 March 2009.

organisations will be absolutely critical to success."[132] While NATO identifies this comprehensive approach at a higher level (political and strategic), the Canadian Forces C2 systems will require no less integration at the operational level as well. The use of the popular term 'Joint, Inter-agency, Multi-national and Public' (JIMP) captures the diversity and level of cooperation/synchronization that will be required.

To complicate things further, promulgating the term JIMP into doctrine is the easiest part of the process. Translating that doctrine into a workable system will require broad paradigm-breaking organizational changes and delegation of authorities that cut across so many boundaries (non-government organizations, other government departments) within Canadian society that the CF, and possibly even the Government of Canada, will be challenged to achieve it. Therefore the CF cannot, from within, develop an operational C2 system that will work without the full collaboration and consensus of all stakeholders defined within the JIMP framework. If the CF was allowed to develop its own approach to operational C2, what would it look like? The application of the 'problem space' to the FSE should provide some indication for where the CF will need to be within the 'approach space', to ensure that the C2 solution that is developed is solving the right problem. In other words, we cannot assume that the C2 solution we have will be effective at dealing with future challenges. Alberts put it succinctly when he wrote:

> *Command and Control* is an approach that, while it was once very effective in achieving its ends, is no longer the only possible or even the best approach that is available. *Command and Control* is a solution to a problem that has changed … *Command and Control* is not well suited for coalition operations, particularly the kind of complex endeavors [sic] called for in the twenty-first

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[132] NATO, HQ SACEUR, "Chiefs of Transformation Conference 2008: Analysis Report 19 December 2009." http://www.act.nato.int/multiplefutures/COTC%2008%20Analysis%20Report%20FINAL.pdf; internet, accessed 15 March 2009, 19.

> century. Furthermore, while it may come as a surprise to some, *Command and Control* is not necessarily the best choice for some military operations.[133]

Remember that, despite its size, the CF has been asked to be ready for anything from the direction given in the Canada First Defence Strategy. While the Defence Strategy is truncated in its consideration of the FSE, an analysis of other doctrine has nonetheless provided a clear enough vision to proceed to the next step of matching the problem space (nature of the problem) to the right approach space (C2 solution). The language used to describe the FSE can be translated into the three variables of the 'problem space' model, namely:

Rate of Change: *Static* ……**X**….*Dynamic*

Strength of Information: *Strong*……**X**…*Weak*

Familiarity: *High*……**X**…...*Low*

These characteristics place the FSE missions into the same area of the three-dimensional model for 'approach space' that is occupied by the edge organization. By transposing the characteristics of the FSE into a more qualitative description of the C2 environment, an optimum C2 'approach space' emerges that equates to the following defined variables:

Decision rights: Unity……X…..Peer-to-peer

Patterns of Interaction: Tight Constraint……X…Unconstrained

Distribution of Information: Tight……X..…Broad

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[133] Alberts, "The Future of Command and Control…," 3-4.

Arguably, the application of the FSE and task analysis against Alberts and Hayes' model is overly simplistic, but it still merits consideration that there is a space between classic C2 and the edge organization which represent a more optimized solution for the future of C2 in the CF. According to the analysis herein, the battlefields of the cold-War are less likely, and the future of 21st century conflict will require more agile organizations with a C2 structure characterized by a flatter C2 architecture.[134] While the argument for a flatter C2 may have culminated, it is still important to remember the historical lessons from chapter 2, given the attention this chapter gave to the importance of a culture of learning and innovation to the successful completion of transformation. An analysis of where CF transformation is now and where it is going will provide some insight into the challenges in achieving a flatter, more agile C2 structure.

CF Transformation and C2

The use of the word 'transformation' is often synonymous with the US RMA discussion. Donald Rumsfeld could have been talking about the Canadian Forces when he said: "we have to put aside the comfortable ways of thinking and planning, take risks and try new things so that we can prepare our forces to deter and defeat adversaries that have not yet emerged to challenges."[135] To be fair, The CF has enjoyed the innovative leadership of recently retired General Rick Hillier. He was, perhaps, the Chief of Defence Staff (CDS) who most understood the challenges Rumsfeld laid out in his

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[134] Alberts and Hayes, "Power to the Edge…," 127-128. Alberts defines agility as "the synergistic combination of robustness, resilience, responsiveness, flexibility, innovation, and adaptation."

[135] Secretary Donald Rumsfeld, Speech given at the National Defense University, Washington D.C. 31 January 2002, http://www.defenselink.mil/speeches/speech.aspx?speechid=183; Internet; accessed 20 March 2009.

speech. Not since the Hellyer days of unification[136] has the CF seen the level of ambition to change itself, represented in the CDS's Transformation Plan for the CF.

One of the biggest changes within CF transformation was the creation of multiple new operational command headquarters.[137] These organizations are currently under review, and have created the need for more staff at multiple headquarters than the Canadian Forces can muster. The stand-up of these new National-Level Headquarters is modelled from a US construct that has been described as largely a stand alone solution, or "…maitre chez nous to DND, which is only one house to put in order."[138] In other words, the creation of these new headquarters solved a national command problem, but was not done considering the wider CF needs (strategic, operational, and tactical level). Initial decisions to create certain organizations may have received criticisms such as the above in its early stages. However, like the historical analysis of the German Army during the inter-war period, the *zeitgeist* of the organization and the message from its leadership in terms of taking risks and innovation were as important as the technology that emerged. What is the *zeitgeist* of CF transformation?

The CDS's second transformation situation report provides the answer to the *zeitgeist* behind CF transformation and lists six key principles:

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[136] Paul Hellyer was a Canadian politician who served as Minister of National Defence (1963-1967). He was a strong proponent and leader of the controversial integration and unification of the three independent services into what is now known as the Canadian Forces. http://www.navalandmilitarymuseum.org/resource_pages/controversies/unification.html.

[137] Canada Command, Expeditionary Command (CEFCOM), Operational Support Command (CANOSCOM), and Special Operations Command (CANSOFCOM).

[138] Bernd Horn, Tony Balasevicius, and David Barr, *Casting Light on the Shadows*, (Dundurn Press, 2007), 202. The authors provide further reference on the Department's reorganization in Charmion Chaplin-Thomas, "Origins and Growth of the DCDS Group" (DND, Feb 2006). On problems of operational command T. Fitzgerald and M.A. Hennessy, "An Expedient Reorganization: The NDHQ J-Staff System in the Gulf War," Canadian Military Journal, Vol. 4, No. 1 (Spring 2003), 23-28.

1. Change initiatives must build a CF culture vice functional or environmental cultures;
2. The C2 structure must shift from a staff-centric to a command-centric construct;
3. The chain of command must shift from a risk-averse approach to an empowered mission command approach;
4. The C2 structure must transform from a staff matrix to a chain of command empowered with authority, responsibility and accountable to a higher commander;
5. The CF must focus primarily on operational effectiveness; and
6. CF transformation must consider the Regular and Reserve components and DND civilians as part of a single solution.[139]

Despite any controversy, these new joint and integrated headquarters (if they survive the review) will steadily add to the corporate knowledge within the CF as they deliver an operational capability. However, the culture of innovation and change that started with General Hillier must survive beyond the ongoing force structure review to whatever happens after the draw-down of forces in Afghanistan in 2011. Any reduction in funding to the CF will only push the three services back into a situation where they will be competing for scarce resources, making it even more difficult to break down cultural barriers. A change from a status quo CF to something entirely different cannot happen without the requisite resources.

There is still hope that the CF can find its way to a joint and integrated C2 solution in a critical position formed through transformation: Chief Force Development (CFD). CFD is charged with leading the Canadian Forces Development efforts from a joint perspective. This differs substantially from earlier CF force development, which until the creation of CFD, occurred within single-service stove pipes. CFD's mission is to "…harmonize, synchronize and integrate the force development activities of the

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[139] General R. J. Hillier, *CDS Transformation SITREP 02/05*7NDHQ, (September 2005).

Canadian Forces…"[140] CFD's role provides an interesting parallel to *Truppenführung* from chapter 2, which provided guidance to the German Army's transformation in a "…coherent, careful, evolutionary fashion."[141] It is within CFD's organization that the potential development of a different C2 system resides. It is therefore worth examining the status of CFD initiatives in this area, and where these developments are leading.

Network Enabled Operations (NEOps)

As part of CF transformation, the CDS tasked CFD with creating joint doctrine, part of which included a vision of future Command, Control, Communications, Computers, Information, Surveillance and Reconnaissance (C4ISR). CFD's C4ISR vision statement reads as follows:

> A command-centric, operationally focused and tactically responsive system of C4ISR that supports commanders and connects people, sensors and systems, through a fully integrated information-based network, from the strategic to the tactical levels… It will meet evolving requirements for a Comprehensive Approach (CA) by ensuring full integration and interoperability with stakeholders in a comprehensive, joint, interagency, multinational and public (JIMP) environment. To ensure continued relevance this system will include the flexibility, agility and adaptability necessary to anticipate, endure and drive change.[142]

Much like the genesis of NCW in the US, the CF has been looking at a NCW-like solution to the problem under the name of Network Enabled Operations (NEOps). Sandy Babcock, a defence scientist with Director Defence Analysis, relates the genesis of

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[140] Canada, Chief Force Development (CFD) Webpage. http://www.cfd-cdf.forces.gc.ca/sites/page-eng.asp?page=5182; Internet, accessed 23 April 2009.

[141] Murray, "May 1940…," 159.

[142] Canada, Chief of Force Development (CFD), "Draft C4ISR OC1." This draft was approved by CFD April 2009 and distributed higher for consideration.

NEOps. He posits that NEOps was developed for the CF because the Canadians involved in the bilateral development (Canada-US) of NCW over the past few years considered the US concept of NCW too focussed on technology and not on the human elements of C2.[143] Babcock goes further to suggest a draft definition of NEOps as an approach to the conduct of military operations "…characterized by common intent, decentralized empowerment and shared information, enabled by appropriate culture, technology and practices."[144]

[145]The Director General Capability Development has been producing renditions of a draft campaign plan which had strongly endorsed NEOps as the solution to the CFD promulgated vision articulated earlier. The draft plan entitled "C4ISR Strategy 2028" was recently denied approval for various reasons. Most importantly, the C4ISR strategy was meant to outline a generic capability or effect that should not intuitively imply any one solution from off-the-shelf. In other words, there was a growing trend that the solution to the C4ISR vision would be NEOps, rather than something entirely different. This does not mean that NEOps is no longer considered a viable solution either. Director General Capability Development's message in denying approval to C4ISR Strategy 2028 was aimed at stopping the CF from 'chasing its allies' in the pursuit of NCW specifically, and risking delivering nothing in terms of a CF-specific C4ISR capability. The direction for the new plan is more pragmatic, and will fully consider available theory, research, and

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[143] Sandy Babcock, "Canadian Network Enabled Operations Initiatives," http://www.dodccrp.org/events/9th_ICCRTS/CD/papers/001.pdf; Internet, accessed 20 April 2009.

[144] Ibid., 4.

[145] All points regarding the C4ISR strategy come from Dr. David Goldsmith and are based on Director General Capability Development C4ISR update brief given 21 April 2009. Based on email correspondence 20 April 2009.

the unique capabilities of the CF in the future. This more deliberate approach is good news considering the assertion by some that Canada cannot afford the technology to fully achieve its own NCW architecture.[146] The futility of trying to model the CF after our biggest ally makes sense considering the US spends more on C4ISR than any nation spends on defence.[147]

> Sheer technological innovation … does not win wars. Instead, the interaction of technical change and organisational adaptation within realistic strategic assessment determines whether good ideas turn into real military capabilities.[148]

CF Culture and Change

> …neither rigid planning for the future nor reacting to events is satisfactory…Thus it is even more important for combat organizations to adopt mechanisms for change and adaptation.[149]

Military organizations (not unlike many others) are resistant to change, perhaps for good reason. Any process of change implies a certain degree of risk. In a military context, failures that occur because of change can have devastating consequences. This is why the US military keeps 15 percent of its forces in a state of change, leaving the remainder to form the core of their combat capability.[150] The comparison in chapter 2

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[146] English, Gimblett and Coombs, *Networked Operations and Transformation…*, 6.

[147] Vance White, "Canadian Forces Transformation: From Vision to Mission," available at http://www.forces.gc.ca/site/Community/MapleLeaf/vol_8/vol8_38/838_08.pdf; Internet; accessed 15 March 2009.

[148] Alan R. Millet, "Patterns of military innovation in the interwar period," in Williamson Murray and Alan R. Millet, *Military Innovation in the Interwar Period*, (Cambridge: Cambridge University Press, 1996), 368.

[149] Sengupta, Kishnore and Carl R. Jones, "Creating Structures for network-Centric Warfare: Perspectives from Organizational Theory," available from http://www.dodccrp.org/events/1999_CCRTS/pdf_files/track_4/017sengu.pdf; Internet; accessed 17 March 2009.

[150] David Hughes, "The Future of Joint Warfighting," Aviation Week & Space Technology, 26 May 2003. 76.

between the Allies and the Germans during the inter-war period of mechanization development provides an example of this. Robert Scales suggests that the Germans started with 'first principles': assess lessons learned, form a clear picture of mobile warfare, develop operational concepts, build machines and organize units. In contrast, Scales contends that the Allies fielded their new mechanized vehicles with much less intellectual rigor, contributing to their shocking defeat to Germany's *blitzkrieg*. As the French and British learned early in World War II, "…if the vision and the concepts are wrong, adding resources simply compounds the error."[151] The interwar period for the Germans gave birth to *blitzkrieg* because of a culture of change. At the start of World War II, both the Allies and the Germans had officers who experienced World War I. In that sense, both sides started on a level playing field. However it was what the Germans did with those experiences that made all the difference.

Like the Germans in chapter 2, the post-Afghanistan period for the CF could be called, for lack of a better word, the start of the CF's own inter-war period. For CF members, post-Afghanistan represents a period of potential transformation through which innovation, experimentation and transformation can occur if a culture of change is fostered. So why has it been so difficult for the CF to affect change? To use General Rick Hillier's words, the problem of transformation is like changing the tires on a car while it is still moving. It will be very difficult to leverage lessons learned and pursue innovation during any inter-war period as long as funding and personnel shortages due to

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[151] Major-General Robert H. Scales Jr., *Yellow Smoke: The Future of Land Warfare for America's Army*, (Rowman & Littlefield, 2005), 19.

Afghanistan and OP PODIUM[152] persist. But General Hillier did try to develop an organization that broke many of the single-service stove pipes within the CF. It was called the Standing Contingency Force (SCF)[153] and it merits analysis.

The Defence Policy Statement of 2005 ordered the creation of the Standing Contingency Force (SCF). The SCF was created as the 'jewel in the crown' of CF transformation, creating integrated and joint effects across the full spectrum of conflict for the CF. The vision of the SCF read as follows:

> A Standing Contingency Task Force will be established to respond rapidly to emerging crises. This high-readiness task force will be made up of existing, designated maritime, land, air and special operations elements, organized under a single integrated combat command structure. It will be ready to deploy with 10 days' notice, and provide an initial Canadian Forces presence to work with security partners to stabilize the situation or facilitate the deployment of larger, follow-on forces should circumstances warrant.[154]

[155]The SCF was intended to be a joint unit, with all of the necessary enablers integrated into a common C2 system. The span of control within the SCF was beyond that of any other formation in the CF at the time. Shortly after its inception and creation, the SCF embarked on its first exercise in November 2006, titled the Integrated Tactical Effects Experiment (ITEEx). The post exercise report identified six lessons, of which three were directly related to C2. The first

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[152] OP PODIUM is the operation name given to the CF contribution to security at the 2010 Winter Olympic Games in Vancouver.

[153] The name 'Standing Contingency Force' (SCF) was the name when the project was cancelled. The original name when it started was 'Standing Contingency Task Force' (SCTF), hence the discrepancy in names between the Defence Policy and this paper.

[154] Canada. Defence Policy Statement 2005, "Canada's International Policy Statement: A Role of Pride and Influence in the World: Defence," http://www.forces.gc.ca/site/reports/dps/pdf/dps_e.pdf; Internet, accessed 22 April 2009.

[155] There is very little official documentation regarding the SCF. The author served in the headquarters during its first and only year. The observations in this section stem from the author's personal experience.

point was that the integrated joint staffs of the SCF headquarters was a model for CF cultural transformation. The second was that the SCF C2 required further refinement and experimentation. The third lesson was that the SCF required a fused, common operating picture (COP). [156] The last two lessons were due to the lack of any investment in a C2 system that could enable the experiment to occur. The C2 arrangement for the ITEEx cobbled together the existing systems on its amphibious headquarters ship (USS Gunston Hall) and combined it with Canadian Naval systems (Naval Task Group) and Land Force Systems (Embarked Landing Forces) among others. Therefore there are no deductions to be made from an equipment perspective, other than to state the obvious: the SCF did not have anywhere near the technology required to fulfill its role. The first lesson regarding cultural transformation generated the least amount of attention, but based on our historical analysis, deserves the most.

In the one year that the SCF was together as a functioning headquarters, there was recognition of cultural differences in C2 and a willingness to let go of service-specific (Air, Army, and Navy) procedures. This may be attributed to service parochialism, which can also serve to hinder the progress of any transformation to C2. Admiral Bill Owens defines Service parochialism as a member's "traditional loyalty to service or military specialty over the armed

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[156] Commodore Paul Maddison, Presentation to Dalhousie Maritime Security Conference, 15 June 2007. http://centreforforeignpolicystudies.dal.ca/pdf/msc2007/Maddison-SCF_Brief.pdf; Internet, accessed 22 April 2009.

forces as a whole, whatever his or her rank or position"[157] These parochialisms have resulted in the different styles of C2 between the services in the CF, and also provide examples with which to apply Czerwinski's command model (by plan, direction, or influence). Czerwinski asserted earlier that the Air Force operates on a command-by-plan model. This is evident in the 48 to 72-hour Air Tasking Order (a plan for the assignment of air resources to missions) that has come to frustrate Army planners on operations for its lack of responsiveness. Canadian Land forces, however, subscribe to a command-by-influence model, relying more on the commander's intent to set the stage of operations, and allowing subordinate commanders to decide on the course of action to satisfy the commander's intent. Both approaches to C2 may be valid and necessary for the environment within which each must operate. The road to developing a C2 system that can work in a joint environment will require further integration of joint forces on training, exercises and experimentation in order to shape service cultures towards a more common ethos that will work for one integrated C2 solution.

Despite any dismal picture that may be painted of C2 in the Canadian Forces, the operational research community is taking the issue seriously and working towards clarifying the claim that Edge organizations outperform traditional hierarchies in complex environments. Based on the foundational work discussed in the previous chapter, a Canadian Defence Research and Development Canada (DRDC) team provided a report that supported some of the earlier US findings that Edge organizations provide greater

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[157] William A. Owens, *Lifting the Fog of War / Admiral Bill Owens with Edward Offley*, (New York: Farrar, Straus and Giroux, 2000), 151.

self-synchronization; a key factor in Network Centric Operations.[158] This Canadian team is continuing to build on the existing body of research. While it is still too early to tell, empirical evidence is emerging which supports the theory that C2 organizations that are less hierarchical and more collaborative in nature (a flattened architecture) are more agile and better suited to meet the demands of 21st century conflict. Funding for the 2009/2010 Fiscal year will see Canadian scientists looking at the relationship between role adoption, team structure, and agility,[159] which promises to provide further analysis of the 'patterns of interaction' variable of Albert and Haye's 'approach space' model. We have seen how the research community is looking at organization and technology and how humans interact within them. The key to command and control, if we hearken back to Pigeau and McCann is the leader itself. I would be remiss if the human, the leader, the commander, as the central element of a C2 solution was not addressed as well.

Building Agile Leaders

Agility can be used to describe equipment, doctrine, and even organizations. Agility is described as one of the main tenets of successful Edge organizations according to David Alberts. Before any of these can become agile, arguably it is the mind of the leader that must be agile first. Warren Bennis, a leading researcher on leadership, provides an interesting analysis of adaptability in leaders in his book *Geeks and Geezers*. Bennis' theory is that the most effective leaders are those who have experienced at least one, intense transforming experience. This *crucible experience*, he asserts, is "both an opportunity and a test. It is a defining moment that unleashes abilities, forces crucial

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[158] Matthew Duncan and Marie-Eve Jobidon, "Spontaneous Role Adoption and Self-synchronization in Edge Organizations Using the ELICIT Platform".

[159] Matthew Duncan, email with the author, 15 October 2008..

choices, and sharpens focus. It teaches a person who he or she is."[160] What defines success in these crucible moments, he argues is called *adaptive capacity*.[161] This adaptive capacity is what allows leaders to respond rapidly and effectively to constant change. It also includes a form of self-awareness that allows analysis and learning, preparing them for further challenges. The organization that prepares senior officers to make the leap from the tactical to the operational level of war is the Canadian Forces College. It is therefore this organization that provides some of the first opportunities to develop adaptive capacity at the operational level of war.

The Canadian Forces College (Toronto, Ontario) is "…the cornerstone in the development of the Canadian Forces' senior officer cadre."[162] Of the courses provided to CF leadership, the Joint Command and Staff Programme is the one that "…prepare[s] selected senior officers of the Defence Team for Command or Staff in a contemporary operating environment across the continuum of operations."[163] The Joint Command and Staff Programme covers the following core subjects:

- Officership Studies
- National Security, International Affairs and Defence Management Studies
- Joint Warfare — Yesterday, Today and Tomorrow
- Joint Operational Planning

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[160] Warren G. Bennis and Robert J. Thomas, *Geeks & Geezers: How Era, Values, and Defining Moments Shape Leaders*, (Boston, MA: Harvard Business School Press, 2002), 16.

[161] *Ibid*., 92-93.

[162] Canadian Forces College Website. http://www.cfc.forces.gc.ca/200-eng.html; Internet, accessed 23 April 2009.

[163] DND, Canadian Forces College, "Joint Command and Staff Programme (JCSP): Syllabus 35" page 1-3/6; http://www.cfc.forces.gc.ca/DP3/JCSP35/cfc300_e.pdf; Internet, accessed 10 December 2008.

- The Joint Force
- A choice of an Elective Course

Included in the syllabus are four practical exercises that are conducted as part of the Joint Operational Planning course. This section focuses on the application of the operational planning process (OPP), a staff function whose aim is the production of an operational or campaign plan. None of the plans developed are executed by the students, leaving a void in the opportunity for these future commanders to experience Bennis' crucible, or even testing their adaptive capacity. Given the CDS's direction in his second situation report to move away from staff functions towards a more command-centric C2 environment, it would benefit the CF if it tested its budding leadership on the execution side more thoroughly. The consequence of not doing so, is that without operational tours to validate the theories learned, there is little other chance that these senior officers will experience the human nature of command until the first time they must do it for real. To make things more difficult for the Canadian Forces College, the CF does not have a standard C2 suite within which students could experience the 'fog of war', pros and cons of different 'approach spaces' to C2, or the crucible of operational warfare that was so critical to the development of *blitzkrieg* during the inter-war period.

This chapter has culminated in the central thesis of this paper: Canadian Forces C2 needs to move from a hierarchical to a flatter, more agile structure. This was accomplished by considering the nature of both the tasks assigned (expectations) to the CF, and the environment (FSE) within which these tasks will be carried out. These factors were superimposed on Alberts and Hayes problem space in order to identify the

region within the three-dimensional approach space that provided the optimum C2 solution for future CF operations. The end result of this analysis was that the uncertainty, complexity, and unconventional nature of future conflict required a C2 structure that is characterized by less constrained patterns of interaction, broader dissemination of information, and decision rights devolved to a lower level more akin to a peer-to-peer construct. This section concluded with Alberts assertion that the best organization to provide the necessary C2 approach space for the future of the CF is the flatter, more agile structure of the edge organization.

The second half of this chapter analyzed the CF specifically to identify where its efforts to transform C2 are today, and what direction it is taking. The results from this analysis portrayed a CF in the early stages of transformation with a *zeitgeist* not unlike that of the German Army prior to the development of *blitzkrieg*. Early attempts within the CF to join the US RMA and pursuit of NCW seems to be dampened by the rejection of a CF strategy to develop NEOps as the solution to the CF's C4ISR problem. The reality is that the CF has its own unique requirements that must fit within the strategic context it must operate. Most importantly, the CF must transform within its own constraints of operational tempo, resource constraints, and the will of its political masters.

CHAPTER 5 - CONCLUSION

The aim of this paper has been to demonstrate that the best future Command and Control (C2) structure for the CF is a flatter, more agile one. The method chosen was meant to be simple: Look at the history of C2 across various conflicts, bring the lessons forward into contemporary theory, and apply the theory to future Canadian Forces operations in order to identify the optimum C2 solution. The impetus for this paper lays within the Toffler's wave theory, which places the CF in a transition from the industrial era (dominated by hierarchy) to the information age. As we discovered in chapter 2, this is not the first time that militaries have found themselves at the crossroads of innovation and change. The RMAs that these past leaders found themselves dealing with were as difficult as the challenge facing the CF today. As the old saying goes, 'the more things change, the more they stay the same'.

Past as Prologue examined the historical 'behaviours' of conflicts in Toffler's second wave, the industrial era. These behaviours contributed to success and failure on the battlefield. From the Franco-Prussian wars to the development of *blitzkrieg* in World War II, this period demonstrated the importance of leveraging culture and doctrine in the face of emerging technologies. Whether is was Napoleon and his new Divisions and Corps, or the Germans demonstrating *blitzkrieg* for the first time in World War II, the critical role of the commander in fostering a culture of innovation and change were critical to some of the most important developments in military history. It was their *zeitgeist* that most affected an organization's ability to adapt, innovate, and make the best of the rapid technological challenges facing them. There were also examples of what not to do. The many years it took to break the trench deadlock during World War I can be contrasted to the rapid advancements of the hundred day's offensive. After years of static trench warfare, the BEF eventually learned that a little trust in bottom-up solutions and a

willingness to take risks can pay dividends. These were all lessons that could be found entrenched in the contemporary doctrine of the next chapter.

Chapter Three discussed the contemporary C2 theory that has dominated the ongoing Revolution in Military Affairs (RMA). Network Centric Warfare (NCW), the primary solution to the US military's C2 problems, has made great promises of broadly networked, far reaching integrated effects offering domination over any adversary. Further analyses of NCW critics identified that it is not yet the panacea that some proclaim it to be. Buzzwords like self-synchronization and role adoption still beg empirical proof before the NCW can move from the realm of theory to reality. Other important factors came to the fore, including an appreciation of the limits to human cognition, and the idea that organization itself can have as decisive an affect as the technology that serves it. Alberts and Hayes important C2 work is suggesting that a classic C2 approach is a solution to a problem that is disappearing in the 21st century. Their flatter-architecture 'edge' organization was theoretically shown to provide more agile C2 in complex and dynamic environments than its rival classic C2 structure. This assertion proved central to an examination of the CF as a potential future user of edge-like organizations in chapter 4.

Chapter 4 looked specifically at C2 in the CF today, and where it needs to be in the future. An examination of the CF portrayed an organization that has been asked by its political masters to be ready for anything. The Future Security Environment was characterized by volatility, uncertainty, asymmetry, and unconventional threats. The missions to be carried out in these environments were predicted to be multi-dimensional, complex, dispersed, and within a Joint, Interagency, Multi-national, and Public (JIMP)

construct. The central thesis of this paper was tested by applying Alberts and Hayes three-dimensional C2 models for 'approach space' and 'problem space'. By doing so, a clearer idea of the variables at play in future CF operations emerged. The ideal C2 solution for future CF operations was characterized by broader information dissemination, less constrained patterns of interaction, and peer-to-peer decision rights. The characteristics defined using the models provided further evidence that the nature of future CF operations requires a C2 solution that is more akin to an edge organization than it is to the classic C2 the CF currently uses. In other words, the CF will need to change from a traditional C2 hierarchy towards a flatter, more agile networked structure.

Finally, this paper concluded by considering where the CF is today and where it needs to be to meet the challenges of future operations. The CF is in the midst of a transformation that is in its infancy. Early attempts to provide a strategy for dealing with future C4ISR challenges have wandered down the US RMA path towards a NCW solution under the guise of Network Enabled Operations (NEOps). Like the Germans in chapter 2, CF transformation is not without its own challenges. However, there is much strength to the momentum initially gained through transformation under General Hillier, not the least of which is a *zeitgeist* of innovation and change. We are seeing again in Afghanistan, Bennis' *crucible*, which can serve to inform future C2 development if its strategic leaders are willing to risk. The mission in Afghanistan will end, eventually. The Canadian Forces, like many militaries before it, will find itself in an inter-war period where lower op tempo and the return of experienced personnel will pay dividends in terms of advancing new concepts pertinent to C2.

The future is unclear, but there are some clear trends for future military operations. The first is that change is certain, and it will be frequent and rapid; manifesting itself in operational environments of increasing chaos. Secondly, potential adversaries will possess technology never thought of before, and use it in ways that we would never expect. Thirdly, that the laws of increased computing power and bandwidth will open doors to methods of operating that can provide the Canadian Forces relative strength. The catch, as we have discussed in previous chapters through an analysis of history and theory, is that only the agile organization will keep pace and survive. Only learning organizations with leaders that give the latitude to take risks in the crucible of conflict will adapt and overcome. One of the keys to getting it right will be an ability to think unconventionally about C2 and treat organizations as weapons. All weapons have their use, time, and place on the battlefield. Every weapon in the operational commander's inventory is another tool in the tool box; the more the choice, the greater the agility. So too is the spectrum of C2 types; a tool in the commander's toolbox that needs to adapt quickly to the situation to provide the best effect, at the right time. Alberts put it best when he said that the need for a renewed look at C2 "…does not imply that the traditional approach to command and control will never be appropriate; rather that there will be situations and circumstances when a different approach will be better suited."[164]

Finally, there is insufficient empirical proof that edge organizations will outperform the traditional hierarchy on more complex military operations. As Moore's Law pushes the Canadian Forces into the 21st century, contemporary theory, as a minimum, is calling for a more rigorous analysis of the way the Canadian Forces will approach C2 in the future. While militaries may be experiencing a Revolution in Military

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[164] Alberts, "The Future of C2…," 2.

Affairs, the Canadian Forces should share the caution of NCW critics and advance its own solutions on a deliberate and empirically proven path. The analysis of both history and contemporary theory points to the need for organizational changes that must accompany these new RMA technologies. These changes cannot occur overnight. They will necessitate long-range planning, unique training, broad organizational changes, and devolution of decision-making in a flatter architecture overall. The friction in developing a more agile and flatter C2 structure for the CF could read as follows:

> It stood on the threshold of the old and the new, somehow contrived to combine the advantages of both without falling victim to their weaknesses. Its organization was superior to that of any of its predecessors, yet still unburdened by excessive rigidity and specialization. It placed heavy reliance on careful planning and preparation but was not misled into believing that this planning and this preparation could be extended beyond the reach of the railheads and into the battlefield. It made use of the best that contemporary technology had to offer but did not allow itself to become the slave of that technology…[165]

If you had guessed that this quote was describing the ongoing RMA, you would be wrong. The above quote is, in fact, a description of the Prussian General Staff of 1866. It seems that 'what was old has become new again'.

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[165] Van Creveld, *Command in War…*, 147.

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