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Robert Addinall is in the second year of the PhD program at RMC. His research interests include war and technology and the development of ideology in modern political thought, and how these factors shaped the periods of Total War and Cold War in the twentieth century. As an undergraduate at the University of Toronto he specialized in history with a minor in English and a number of courses in political science. His M.A. thesis at U of T focused on the effect of Soviet and German intelligence and deception operations on the campaigns of the Second World War. He has worked in the Information Technology sector, both in start-up companies of the late-1990's "tech boom" specializing in search technology, and in IT marketing and consulting with a Toronto firm. This combination of academic and professional expertise has led to his interest in comparing patterns of technological innovation and "revolution" from different periods of history. In the paper presented at this conference he focuses on two historical periods in order to show how such patterns have affected the Canadian military.

### **Abstract**

When the young Canadian state became de facto responsible for its own defence after 1871, the Canadian Militia was a fairly disorganized and unprofessional force. This responsibility came at a time when technological innovations were changing the strategic landscape of the world militarily as well as in other ways. Economic and political factors within Canada and organizational factors within the Militia itself prevented it from modernizing quickly. Despite these frustrations, Canadian military thought evolved during the period, displaying an incipient understanding of the "tactical dilemma" of the late nineteenth century. The evolution of this thought was closely linked to the development of British military thinking, but impetus for independent military innovation did arise in Canada. The creation of a munitions plant in Quebec City, the development of the Ross Rifle and the Oliver harness, and the maintenance of a citizen-soldier ideal in response to major events were ways in which Canadians differentiated their response to change from that of others. By following the evolution of thought, and its interplay with technology, tactics, organization and politics in a past period, useful lessons can be drawn regarding late twentieth century ideas of military "revolutions".

## Preparing for Change in Technology, Tactics and Organization in Canada: Late 19<sup>th</sup> Century Military Revolution and 1990's RMA

Robert Addinall

*“In essence, a Revolution in Military Affairs is 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.”*

*- Canadian Defence Beyond 2010<sup>1</sup>*

*“Still confining ourselves to the narrow limits of human foresight, we can nevertheless state, with complete certainty, that probable future wars will be radically different in character from those of the past... clinging to the past will teach us nothing useful for the future, for that future will be radically different from anything that has gone before.”*

*- Giulio Douhet, 1921*<sup>2</sup>

While the first statement above provides a definition for “Revolution in Military Affairs”, the second illustrates that members of earlier generations have also felt themselves to be experiencing what we today call a RMA. But despite the belief – which appears often enough in each period of change – that the past has nothing useful to teach us, every period of military-technical change in fact has to deal with the same style of problems: how to adapt tactics, doctrine, force structure, command and control and other concepts to the introduction of new technology.<sup>3</sup> The details of change are, of course, quite unique each time, but the overall way that the learning process was handled in the past can teach useful lessons about how to proceed in the present.

In the period of its existence as a modern state, from 1867 to the present, Canada has experienced at least four periods of RMA-style change. The first is the firepower and communications revolution of the late nineteenth century, the implications of which were not fully understood until near the end of the First World War. The second is the inter-war period of mechanization, armoured warfare and airpower – often referred to as *blitzkrieg*. The third is a series of technical and organizational changes in conventional forces which were accompanied by the introduction of nuclear battlefield theories in the 1950's-60's. The fourth and final is the current RMA, which originated in the late Cold War but became a more widely discussed concept during the 1990's. Common themes link each of these periods, and comparative study of all of them would be useful. However, for the purposes of this discussion the focus will be on the first – that of the late nineteenth century, and the last – that of the 1990's RMA.

Both of these periods saw communications revolutions. Both also saw the desirability of integrating more closely discrete military “arms”. In the nineteenth century arguments were put for repeatedly for the development of “combined arms operations” which would integrate more closely the actions of the infantry, artillery and cavalry. In the late twentieth century a similar discussion has arisen concerning “jointness” which seeks to integrate the ground forces, air force and navy. Finally, in the late nineteenth century the country’s military capabilities were constrained to the

point that it was unable to effectively experiment with new technologies. The same pattern seems to be emerging since the end of the Cold War. As a result the Canadian military turns to the experiences of others – typically the strongest ally – to try to understand how force structure might have to be organized in the future. The nineteenth century experience shows that it is not necessarily correct to assume that the world’s superpower will “get it right” or that its force structure will be entirely applicable to Canada’s requirements.

This study contains a sub-theme that because of the common experiences binding all these periods of change, “revolutions” in military affairs are simply part of longer-term, linked, evolutions. However, addressing the semantics of the terms “revolution” and “evolution” would cause this discussion to become unreasonably extended, so the term “revolution” will continue to be used here as a convenient shorthand.

### Canada and late 19<sup>th</sup> Century Military Revolution

In the late nineteenth century new forms of transportation and communication changed the organizational structure of military forces, while improvements in rifle technology gave infantry units greatly increased firepower. Early machine-guns, though not used to full effect during much of the period, further increased firepower. These developments outmoded traditional drill tactics which had been used on European battlefields and necessitated the development of new tactical and training doctrines. These new doctrines in turn required a complete overhaul of the soldier’s uniform and personal equipment as the demands on the individual infantryman changed. The same developments eliminated the effectiveness of traditional cavalry and created a tactical dilemma which could in the long run only be broken by the development of effective combined arms operations utilizing infantry, artillery, mounted infantry and towards the end of the period, tanks and aircraft.

During this period military attempts to improve the military took place in Canada. The more significant of these included the development of the Ross Rifle and the Oliver harness, the creation of a munitions plant in Quebec City, and the maintenance of a citizen-soldier “Militia Myth”. However, such innovations were not carried through as part of a successful and coherent reform of the military system. The reason for this lay in the nature of the militia and Canadian politics and economics. The patronage system, the need to spend money building up basic infrastructure for a small, widely dispersed population, and concerns about imperial defence issues all distracted politicians from making lasting commitments to improve the state of the militia. Within the militia itself internal rivalries and patronage politics also helped to prevent coherent reform, while a lack of appropriate types of industry hindered attempts to produce munitions inside the country. Under these conditions it was only the pressure of the First World War which transformed the Canadian Militia into a modernized and professional Canadian army.

Before the mid-nineteenth century, the basis of both military tactics and organization was drill. The cutting and throwing weapons of ancient warfare, and the slow-loading muskets of the early gunpowder period, required great density of numbers in order to create sufficient firepower to halt an enemy formation. But as rates of fire increased, closely packed infantry formations became unsustainable, as they were simply massed targets for fire.<sup>4</sup> To solve this problem military

thinkers turned to another tradition: that of the skirmisher. Skirmishers were typically agile troops who advanced ahead of their main force to mask its movements and to observe and harass the enemy.<sup>5</sup> Beginning in the 16<sup>th</sup> century European skirmishers were armed with rifles and were expected to use their own initiative, and by the 18<sup>th</sup> century had evolved into forces of sharpshooters.<sup>6</sup>

Apart from concentration of force, the other factor which kept armies densely packed were the limitations inherent in communications. Since classical times there had been attempts to improve communications using optical telegraphs. Fire, smoke, and flags were used in such systems, but the ability of the human eye to make out differences between signals was always a limiting factor, meaning that stations had to be constructed close together, or else the types of information transmitted had to be prearranged and limited in content.<sup>7</sup> Beginning in the 1750's attempts were made to develop electrical telegraphs.<sup>8</sup> With the eventual success of these experiments, communications were tied into the other major communications development of this period: the railway. Although trains provided a massive increase in speed and hauling capacity over anything previously in history, unlike wagons they were limited to movement only along rail lines which had been built, and were unable to stop or temporarily leave the track to let another vehicle pass.<sup>9</sup> As a result a great deal of administrative bureaucracy was required to handle railways. Two trends began to emerge here. The first was that the nature of command began to change from that of immediate presence on the battlefield to that of administration. The second was that coordinated strategic movements and intelligence concerning enemy movements could be quickly passed between different forces on the same side, allowing different armies or army groups to conduct coordinated operations in one campaign out of sight from one another. Although at the time it was not put in these terms, the possibility of the operational level of thought, between tactics and strategy, had emerged, and an incipient need for general staffs to manage operations had been created.

It should also be noted that the ability of railways to move massive numbers of men and amounts of equipment, combined with the ability of the telegraph to coordinate the actions of bureaucratic systems across large areas, made it possible for much larger armies than ever before to be mobilized. Thus, not only because the telegraph and its successors allowed communication at a distance, but also because armies were simply too large to be seen in their entirety from one spot, senior commanders had to accept the role of administrators.

In terms of firearms technology, during the nineteenth century the trend for weapons range to increase accelerated. The cylindro-conoidal bullet was invented in 1823. Rifles using this type of ammunition could be loaded as easily as muskets, thus bringing the era of the smoothbore musket to an end.<sup>10</sup> This was followed in mid-century by the introduction of "long" bullets and breechloading. The first breechloading rifles leaked gas and flames from the seams of the breech back into the face of the shooter. One of the major tactical impacts of the breechloader was that it could be fired by a soldier lying in the "prone" position, since the rifle did not have to be held up and the shot rammed down the barrel. Firing from the prone position created new opportunities for individual concealment and cover on the battlefield. This development was further enhanced by the introduction of smokeless gunpowder. During the American Civil War a repeating rifle also

appeared, Christopher Spencer's seven-shot weapon with rim-fire cartridges, which increased a soldier's rate of fire to sixteen shots a minute.<sup>11</sup>

Paralleling developments in rifles during the nineteenth century were developments in artillery, which took place in four stages: the adoption of rifling, the change to breechloading, improvements in interior ballistics, and the development of a better recoil mechanism.<sup>12</sup>

The tendency towards greater dispersion on the battlefield has been discussed above. With the introduction of these new weapons systems, the effect became noticeable. As formations dispersed, fronts elongated. Although dispersal was bitterly resented in many armies, generals of the Civil War helped the development along by recognizing the futility of placing troops where casualties were thickest and instead sending them to reinforce the flanks.<sup>13</sup> General Robert E. Lee recognized this at an early stage and encouraged his infantry to become skirmishers, spreading out and seeking cover.<sup>14</sup> Dispersal was a trend that would continue, causing the modern battlefield to gradually assume, in one theorist's phrase, an eerie, empty look.<sup>15</sup>

Dispersal also protracted the length of engagements, since units no longer presented themselves in close order as targets to be annihilated. Two-day and longer battles became commonplace for the first time in the 1860's.<sup>16</sup> In these battles infantry formations also learned to leapfrog through each other in order to maintain fire on enemy positions until the last possible moment.

In response to the increased range and accuracy of the rifle, forces began to consistently build log-faced earthworks and dig trenches, with defensive entrenchments at the end of the Civil War including wire entanglements, trenches, dugouts, listening posts, and bomb shelters. The tendency of open warfare between large armies to resolve into close encounters around fixed points grew with each of the major conflicts of the late nineteenth century.<sup>17</sup>

The rifle, rather than the machine-gun, was the main weapon providing fire in these conflicts, but it, when combined with the other technological changes described above, produced a series of wars which presaged the First World War more than they reflected those of their predecessors. The types of skill required from a soldier changed; instead of being efficient at reloading techniques, the soldier instead had to individually be a good shot with his weapon. This new factor, when combined with the influences discussed above which removed high-ranking officers from direct control at the front, meant that it was necessary to encourage individual initiative amongst the lower ranks.<sup>18</sup> This was the crux of the firepower dilemma. As John Keegan has noted, around the turn of the twentieth century military leaders looked for solutions in two areas: they argued for greater firepower to ready the assault, but they also argued that the infantry must find, at the moment of final assault when the supporting fire fell away, an extra, almost superhuman, edge to their courage.<sup>19</sup> The future Marshal Foch told the French Staff College in 1900 that "The most ardent troops, those whose morale has been most excited... will encounter great difficulties... whenever their partial offensive has not been prepared by heavy fire."<sup>20</sup> Colonel Maude of the British army in 1905 stated that "The chances of victory turn entirely on the spirit of self-sacrifice... The true strength of an Army lies essentially in the power of each, or any of its constituent fractions, to stand up to punishment, even to the verge

of annihilation if necessary.”<sup>21</sup> The result, in Keegan’s view, was that military intellectuals were proposing that to solve contemporary battlefield problems, fire should be heavier and soldiers braver<sup>22</sup> – what has come to be known more generally as the “Cult of the Offensive”.

The contradiction between these ideas was emphasized by 19<sup>th</sup>-century attempts to understand war as a “science” as well as an “art”. Studies of battles by major European powers, including Britain, revealed that the effect of rifle fire dropped at ranges under 600 yards, due, depending on the interpreter, on factors related to the average skill level of troops with their weapons, as well as the psychological influence of a firefight at close range. It was recognized that these factors created a beaten zone of enemy fire at a certain distance from an enemy position, and that if one could get through the beaten zone to the “dead ground” where the effect of enemy fire diminished, it would then be possible to manoeuvre and attack effectively from this location. It was recognized that it was possible to use terrain to one’s advantage to gain such positions. However, military thinkers then took the next step of suggesting that, since enemy fire was less effective at such close ranges, a final charge was both survivable and desirable.<sup>23</sup>

The increased range, accuracy and rate of fire of both the rifle and artillery also brought an end to the use of traditional cavalry. Cavalry changed from a shock arm to a multipurpose mobile force: it could be used in reconnaissance and long-range raids against communications and supplies, to cover the flanks, and as mounted infantry which could deploy quickly and then dismount to fight.<sup>24</sup>

From the 1860's on, an awareness in the Canadian Militia of emerging military problems and the need to repair and modernize equipment and adopt effective organization and training can be seen in various papers, lectures and recommendations. In 1866 the formation of a special railway brigade made up of railway employees was suggested in the annual Report on the State of the Militia, based on the argument that “in time of war, it would be of the most vital importance that the railroads of the country should be in full working order.”<sup>25</sup> In the same year it was commented that: “many of the troops of Cavalry have at present no arms but antiquated sabres; and are unprovided with military saddles and bridles,” while “the harness of the Field Batteries... is falling to pieces from age and rottenness.”<sup>26</sup> In the 1870 report it was recommended that the cavalry, now equipped with Spencer carbines, be trained to act as mounted riflemen since:

In a close and intersected country like Canada, abounding in woods, water, fences and obstacles of all kinds, opportunity for regular cavalry charging in line... is not likely to be afforded, but the services of mounted infantry or riflemen would be found invaluable... they would be better suited to take outpost, picket, and escort duty... better enabled to harass and act upon the communications, flanks, and rear of an invading force... The experience of the last war in the neighbouring Republic... proves incontestably the practical advantages of mounted riflemen, instead of regular cavalry, for the kind of warfare usually carried on in America... It is worthy of note, moreover, that... it is proposed to convert the yeomanry cavalry in England... into mounted riflemen.<sup>27</sup>

A sense of the growing effectiveness of mounted infantry using modern rifles was taking shape, although the arguments against traditional cavalry were still couched in terms of the

geographical nature of the country, rather than the futility of cavalry against modern firepower. Recognition of the future shape of battle for infantry forces was clearer. Also in the 1869 report it was stated that:

...the requirements of modern warfare, resulting from the use of rifles of long range and precision, do not involve the same character of drill, rigidity of movement, and closeness of formation, as was formerly necessary; but what is indispensable now, especially in Canada, is the practice of a judicious and intelligent system of skirmishing drill, suited to the character of the country, and in the taking up of positions, either for attack or defence, in connection with the other arms.<sup>28</sup>

Thus in the wake of the American Civil War, even before Canada's own experiences with the North West Field Force and the Boer War, the need for both skirmishing tactics and combined arms operations was being propounded. In the 1870 report it was recommended that field artillery batteries be re-equipped with rifled guns, "smooth-bore ordnance being now almost obsolete," and that new batteries be created in order to provide sufficient artillery support for the infantry.<sup>29</sup> Organizational problems were also recognized. During the 1860's a recommendation was made for the creation of a comprehensive system of magazines in order to be able to properly equip large numbers of men called out for service.<sup>30</sup> In the report of 1867 it was noted that "great inconvenience had been experienced" during mobilization against the threat of the Fenian Raids because:

the force consisted for the most part of isolated Companies; the Volunteers of the principal cities having been alone formed in battalions. Thus... it became necessary to form the isolated Companies into provisional battalions, and to appoint a provisional staff to each battalion in a hurry, and at an obvious disadvantage.<sup>31</sup>

The desire to create a more professional officer corps was also evident – this can be seen, for instance, in the militia report for 1873, which included a "Memoranda on the Military educational systems of England, France, Prussia, and the United States of America".<sup>32</sup>

From the 1890's on the publication of the journal of the Royal Canadian Military Institute provided a further outlet for Canadian military thought. A piece by Lieutenant Colonel T.C. Scoble dating from 1897, entitled "A Modern Battlefield", adapted from a lecture he gave at the Institute, is a concerted attempt to focus on late 19<sup>th</sup> century changes in technology and tactics. Speaking of the Franco-Prussian War and other contemporary events, he states that:

...even these most recent examples afford little precedent for the warfare of the future. The progressive improvement in military weapons continually alters the tactics of all arms of the service, and it is with a view to give some idea of the most important changes that I venture to embody the ideas of the most recent authorities as to how a modern battle would presumably be fought.<sup>33</sup>

The point of such study, Scoble suggests, is that while in the time of "Conde, Turenne, and Marlborough" soldiers could be educated on the battlefield, in modern war the constant study of military development is needed to create successful leaders.<sup>34</sup> In laying out the battlefield, he describes the type of defensive system which emerged in the major wars of his time, complete with trenches and gun pits, barbed wire entanglements, inundations and so on.<sup>35</sup> He notes the strength of the defense, and makes the point that a force moving in the open against such defenses will be

exposed to terrible fire due to the “precision and long range” of rifles.<sup>36</sup> The importance to both the offence and defence of concealment and camouflage, effected by using the natural features of the terrain, is noted, as is the importance of smokeless gunpowder.<sup>37</sup> The battlefield he describes, with skirmishing lines and concealed defences, is taking on the “empty” feeling of modern warfare mentioned above.

Other articles from the 1890's published by the Canadian Military Institute make similar points regarding the evolution of warfare. An article entitled “The Characteristics and Employment of the Three Arms, and the Principles of Attack and Defence” by Major F.L. Lessard of the Royal Canadian Dragoons includes a discussion of “the three arms combined” and makes the points that:

All attacks must now, more than ever, be operated by heavy fire from the artillery. And it is no less certain that the safety of this artillery... can only be assured by the co-operation of an adequate force of infantry. The first mark, again, for all the artillery should be, at first the enemy's guns, with a view of subduing or materially reducing their fire.<sup>38</sup>

Lessard's comments presage the importance of artillery-infantry cooperation in the Canadian Corps at Vimy Ridge and Amiens during World War I. Articles discussing the duties of staff officers<sup>39</sup> and the importance of properly organizing armies for war also appear. Some of these indicate full appreciation of the new administrative nature of military leadership, and the need for a professional staff:

In these days of elaborate organization and of rapid movement, necessitating complete appreciation of every detail of a soldier's duties and of the thousand and one complicated accessories of a modern war, no genius in the world could carry out the leading of an army single-handed.<sup>40</sup>

Scoble and the other Canadian thinkers are, however, in the same position as their contemporaries in other armies in being unable to grapple with the firepower tactical dilemma. While Scoble emphasizes the importance of firepower, in the last phase of his description of battle the infantry have to charge into enemy positions to deliver the final assault by bayonet. He emphasizes that in the assault “the forward movement must be sustained... it keeps up the ‘moral’ of the assailant, and intimidates the enemy... From the moment when the assault columns join the firing skirmish line there must be no halt.”<sup>41</sup> He also quotes Major General E.T.H. Hutton as stating that: “In modern battles infantry once committed to attack cannot be withdrawn, except with undue loss of life and loss of some initial energy and even of ‘moral.’”<sup>42</sup> Thus military thought in Canada up until 1898 was developing at the same pace as that in the rest of the world, both in terms of lessons learned and problems left unsolved. Judging from the discourse of the time the possibility for significant improvements in the Canadian Militia existed.

However, despite awareness of problems there were few real improvements to the Canadian Militia until the 1890's. It was disorganized and virtually unarmed and untrained. Crises including the Trent affair of 1861-62, the Fenian Raids of the late 1860's, and the North West rebellion of 1885 created brief waves of support for the military, both in the form of volunteers for the militia units and in the form of government recruitment drives.<sup>43</sup> However, although the need for coordinated

defence of British North America against the threat of the Union armies turning north was used as one of the arguments for Confederation,<sup>44</sup> the American demobilization which followed quickly after the end of that country's civil war caused the fears of Canadians to be allayed.<sup>45</sup> The Reports on the State of the Militia show both the confusion and the waxing and waning of support.<sup>46</sup>

The original model for the Canadian Militia was the British Regular Army garrison of the mid-nineteenth century.<sup>47</sup> Reliance on Britain extended to all manner of equipment. A Lieutenant Colonel Powell, after a trip to England to arrange the annual supply of clothing for the active militia, stated in 1870 that the time had come for the manufacture of such basic supplies to be done in Canada.<sup>48</sup> However, when attempts were made to follow up recommendations to procure military clothing locally, they initially failed. Although Canadian cloth manufactures were well established by the 1870's, they did not normally produce the types of cloth required by the military, and the militia's requirements were not large enough to attract them. Such Canadian supplies as were produced were inferior in quality and more costly than British products. It took a decade before enough expertise was built up for Canadian apparel to meet specifications. As Ron Haycock has demonstrated, these problems presaged later developments in Canadian munitions history.<sup>49</sup>

There was no service corps to transport, clothe and feed the fighting force, and during years of low funding few of the volunteers trained.<sup>50</sup> Officers shared in expenses for equipment and elaborate uniforms reminiscent of the old European drill armies; the 10<sup>th</sup> Royal Grenadiers, as an example, had a Havelock cap, a full red tunic, heavy corduroy trousers, and a wide leather Sam Browne belt.<sup>51</sup> Some items of this equipment were quite impractical, such as the Trotter knapsack which remained in Canadian service until 1898. Little change took place in infantry accoutrements with the shift from muzzle-loading to breech loading weapons, apart from the removal of the percussion cap pocket and strengthened tin for the ammunition pouch.<sup>52</sup> Up until 1898 the supply of waterbottles to the Militia was hit-or-miss.<sup>53</sup> Some items of British Valise Equipment Pattern 1871, designed to better distribute the weight and balance of the infantryman's load, reached Canada and were worn by members of the small Permanent Force. Maintenance of equipment was also often poor. The condition of rifles and other equipment was commented on repeatedly in the Annual Reports on the State of the Militia.<sup>54</sup>

Tactical developments for the bulk of the Militia came just as slowly as new equipment. The limited nature of the mock battles at the training camps allowed officers to lead in the old way, able to see much of their force on the battlefield, rather than having to delegate responsibility within a widely dispersed formation. In terms of tactical doctrine, the Canadians inherited British infantry line formation which, as can be seen in the comments of Scoble and others above, began to shift towards a more ragged skirmish line by the end of the century. Such an approach retained control at the highest tactical level, but meant that junior leaders had little freedom to carry out independent actions.<sup>55</sup> Beyond the common practice of fighting in line, the specifics of British tactics were nebulous. At the time, tactics was a new phrase and could be defined in various ways.<sup>56</sup> Training was normally delegated to unit commanding officers who trained their troops based on their personal experience. The only guides for the infantry were the Drill and Field Evolution manuals. There were no guidelines for inter-arms cooperation.<sup>57</sup>

Following the Cardwell Reforms of 1870-72 British military thought broke into three schools: the Traditionalists and two groups advocating new tactics to adapt to changing conditions; the British Imperial School, and the Continentalists.<sup>58</sup> The Imperial school attempted to draw lessons from the army's constant experiences in colonial wars throughout the empire. In many of these operations the use of massed forces had proven detrimental, so the Imperial school emphasized the need for small tactical units operating in skirmishing order. The Continentalists, on the other hand, drew their lessons from experiences on the European continent. The problems of understanding war scientifically, building up general staffs and improving command and control concerned them. The Continentalists also realized the importance of a strong relationship between discipline, training and independent skirmishing, but fell, along with the European armies, into the trap of not recognizing how infantry could be devastated in long-range engagements with modern firepower.<sup>59</sup> Through Frederick Middleton, commander of the North West Field Force in 1885, through Woolwich-educated British officers training cadets at Canada's Royal Military College, and through many British officers on half-pay who sought Canadian appointments, Continentalist thought became the largest British influence on the Canadian militia.<sup>60</sup> It is the theoretical influence of the Continentalists which can be seen in the thought of Scoble and other Canadians military thinkers of the time. However, because the conditions in the training camps did not change, the ripple effects of British thought remained largely theoretical for the Militia.

Despite being continuously influenced by the British, the Canadians possessed their own version of skirmishing tactics – that based on the citizen-soldier “Militia Myth”. This myth emphasized the natural prowess of the untrained citizen-soldier, who knew how to fire from the “right hand side of the tree”, and was thought to possess the freedom to deploy himself and his weapon where he thought best.<sup>61</sup> Because of the myth, most militiamen resented too much discipline and control and, due to the volunteer nature of the force, could resign if they felt bored or irked. It also provided a self-justification for the lack of detailed tactical training at the camps. Militiamen could argue that their lack of rigid British drill training was a virtue. In keeping an open minded approach towards tactics the Militia Myth was potentially a constructive idea, but when misapplied it contributed to a continued lack of professionalization and modernization in the Militia. The conclusion that can be drawn from the above discussion is that little tactical development took place in the Militia because the opportunity to train on a large scale and with modern equipment, as well as to inject discipline into the force, did not exist.

Apart from difficulties producing military equipment in Canada which were beyond politicians' control, the reasons for these missed opportunities were rooted in patronage politics and Imperial defence issues. Patronage was a significant factor in Canadian politics in the late nineteenth century. The reasons for this have been discussed sufficiently elsewhere, and need not be examined in detail here. At the time the concept did not have the negative connotations which it would acquire by the late twentieth century. Rather, because the government in Canada was fairly young and did not possess extensive bureaucratic arms, often the only way for a political leader to get something done was to personally contact those he knew could do it – typically friends or acquaintances. As has been noted above, the officer corps of the Militia was a social club as much as a military organization. Battalions were typically political organizations which, to use Desmond Morton's phrase, mobilized their members at the polls. In the first seven parliaments after

Confederation between one quarter to one sixth of the MPs were militia officers, and the annual debate on the militia budget was known as “Colonels Day”.<sup>62</sup> Needless to say, the “Colonels” constituted a powerful political force, and each pulled the strings of patronage to benefit his own unit. As a result, the \$1 million military budget was spread around thinly to satisfy political connections, and it was virtually impossible to consider weakening or disbanding the mass of volunteer regiments in order to focus money on a much smaller but more modern and professional force.

Continuing problems concerned Canada’s relations with Britain and the rest of the Empire. Most Canadian politicians of the time did not want Canada to be involved in overseas imperial adventures. From the 1860’s, Sir John A. Macdonald had believed that since Britain controlled the foreign policy of the empire, it should also be responsible for dealing with threats to Canada militarily. This applied even more so to any threat to the empire which appeared to not involve Canadian interests directly. Prime Ministers Mackenzie and Laurier held similar outlooks. For instance, speaking during the Sudan campaign in 1884-85, Macdonald said:

Why should we waste money and men in this wretched business? England is not at war but merely helping the Khedive to put down an insurrection... Our men and money would therefore be sacrificed to get Gladstone & Co., out of the hole they have plunged themselves into by their own imbecility.<sup>63</sup>

Two final factors served to increase the effect of the above problems. From the 1870’s to the 1890’s Canada suffered an intermittent and at times severe economic downturn which prevented both Conservative and Liberal governments from spending more on the military than was necessary to keep militia votes.<sup>64</sup> The politicians also realized that better equipment would have led to better efficiency, which could in turn have led to greater demands by a Militia which was now capable of deploying overseas.<sup>65</sup> This approach worked until the Boer War, as Canada generally avoided official commitments to imperial military operations up to that event.

Given few chances to train effectively, the Militia’s real opportunities for practical learning were actual campaigns. Major tests of the abilities of the Canadian Militia in the field came on two occasions before 1898.<sup>66</sup> The first of these, during the 1860’s, was the Fenian Raids. The second was the campaign of the North West Field Force against Louis Riel’s rebellion in 1885. In both of these operations the Militia was fighting a relatively technologically and organizationally undeveloped foe. Against the Fenian raids it deployed as a more-or-less typical mid-nineteenth century force. In 1885 it deployed with newer technologies, including railway and telegraph linking the territories to a semi-industrial national heartland, steam driven river boats available in the area, and rifled artillery, early machine guns and preserved rations.<sup>67</sup> However, it lacked optical range-finders or topographic maps, and as has been seen the final links in the Canadian railway system were incomplete. In addition, during the course of the campaign it became clear that the Militia had failed to adequately adapt its organization and tactics to the use of rifled artillery and machine guns. Poorly maintained and mishandled equipment could not function as part of a modern military system.<sup>68</sup> The campaign did not last long enough to force the Militia into improving the use of these technologies.

However, at the turn of the century the Boer war created an opportunity for tactical and organizational improvement for both British and Canadians. British forces involved in the conflict initially displayed similar failings with regard to handling of modern technology as the Militia had in the Canadian northwest.<sup>69</sup> The weakness of the army was thus made evident, and a political spur emerged for reform in Britain. Combined arms tactics, the use of extended skirmishing-type formations based on individual initiative amongst the troops, and the use of mounted infantry for reconnaissance, speed and manoeuvre again came to the fore in memoranda, orders, and discussions of military reform.<sup>70</sup> Reliance on frontal assault in line or column began to be abandoned. The experience gained in the Boer War the British developed clear and consistent doctrine and training for the first time, issuing a series of manuals covering all arms as well as combined training between 1903 and 1907.<sup>71</sup> The war also inspired the Haldane reforms of 1904, which included the creation of a general staff for the British Army.<sup>72</sup> Through the direct experiences of the many Canadian soldiers who fought in the Boer War, as well as through the extensive intellectual links which ran between the British and Canadian militaries, the Militia absorbed all of these lessons. However, the Militia Myth in Canada and a re-emergence of Traditionalist and Continentalist ideas in Britain would cause some of the lessons initially absorbed to be lost yet again.

The Boer War further increased the reverence for the power of the modern rifle in British and Canadian military thought.<sup>73</sup> In Canada this was taken to mean that the citizen soldier who could shoot was at least equal to a regular soldier.<sup>74</sup> In 1902 an issue of the Canadian Military Gazette included a commentary stating that “We proceed on the idea that the soldier, especially the Canadian soldier, is born, and that no making is necessary.”<sup>75</sup> Subsequently Rifle clubs and associations, cadet corps and military training in schools became integrated into a general drive to create a trained and armed citizenry.<sup>76</sup> With this fixation on the citizen’s marksmanship skills the Canadians focused less on other tactical developments such as the skillful use of ground which required much more extensive and professional training.

In Britain the argument that the “Boer war is altogether a different plan from what a war in Europe would be” led thinking to return to the idea that “manoeuvre is essentially a fire problem, and... in war fire is everything”.<sup>77</sup> Many British generals rejected the importance of artillery; General Haig claimed that it was only “effective against demoralized troops.”<sup>78</sup> Instead the tactical lesson was turned on its head; the effectiveness of modern technology, it was argued, meant that heavy casualties were a foregone conclusion and a sign not of failure but of determination and strength.<sup>79</sup> This interpretation was then further extended by an argument that the longer troops were exposed to fire in the enemy’s defensive zone, the greater would be the losses caused by modern weaponry. Fire and movement, it was argued, would merely slow troops down in the beaten zone, so rapid frontal assault was rationalized as saving lives.<sup>80</sup> British thought rejoined that of the French and other European armies that a superhuman edge to infantry courage when supporting fire fell away was the key factor in deciding battles. Focused on their own Militia Myth ideals the Canadians would follow this British lead as they entered World War I.

Following the Boer war Canadian military organization and self-sufficiency improved. New formations, including the Canadian Signalling Corps and the Canadian Engineer Corps (later Royal Canadian Engineers) were formed, many of which experimented with new technologies towards the

goal of fulfilling their tasks.<sup>81</sup> The turn of the century also saw Canada obtain a magazine-loading rifle. From the 1880's attempts had been made to develop a magazine-fed rifle for the Canadian Militia, such as Charles Greville Harston's conversion of the Martini-Henry .45 calibre rifle, but did not get far because of the lack of a Canadian agency for the systematic assessment of ideas as well as a lack of political desire to spend money on military supplies.<sup>82</sup> With the British also unwilling to license the Lee-Enfield for production in Canadian factories, Militia Minister Frederick Borden decided to obtain a design which could be manufactured in Canada. To this end he accepted the ideas of the Scottish entrepreneur Sir Charles Ross and began the organization of a private enterprise for rifle production, along the lines of the Winchester or Remington Arms Companies in the United States or Mauser in Germany.<sup>83</sup>

The Ross was not a bad weapon. As Haycock has described, it was envisioned as "a high-velocity .280 calibre rifle "system" that would have allowed the average soldier with limited training to hit a target as far away as he could see, without complicated sighting changes."<sup>84</sup> In target competitions, with backing from Borden, Canadian marksmen won a long series of victories with the Ross.<sup>85</sup> Borden stacked the rifle's testing committees in 1902 with militiamen and civilian rifle shooters to overcome the aversion of British and British-trained professional soldiers to equipment differences between Canadian and British forces.<sup>86</sup> As a result the rifle was adopted, along with a variety of government subsidies and rebates being awarded to the Ross factory. However, Borden in the end chose to placate advocates of imperial uniformity by agreeing that the production rifle's calibre would be changed to the official British .303 cartridge. Sam Hughes, who became a devotee of the rifle, also interfered with the technical design so that it would be better suited to winning competitions. Despite attempts to finesse the production unit, the result of replacing a fundamental part of the original design was to disrupt the entire "system", and so costs escalated, delivery dates were missed, and technical problems such as jamming arose.<sup>87</sup>

The problems with the Ross represented one element of Canada's shift into the magazine-loading period, but just as important was the attempt to modernize the soldier's personal equipment. Attempts to modernize in this area paralleled in many ways the setbacks with the Ross. While British infantry had adopted the "Slade-Wallace" Valise equipment Pattern 1888 roughly in concert with the introduction of the Lee-Enfield magazine rifle, the Canadian Militia chose to examine a number of different equipment systems. In 1879 a British committee had examined two new valise systems, the Oliver and the Barrett, but rejected both. The Oliver was developed by Surgeon-Major William S. Oliver, who had served in Canada as regimental surgeon with the 1<sup>st</sup> Battalion, 50<sup>th</sup> Rifles, and had accompanied that unit in the Red River Campaign in 1870. It was after this, when he was stationed in Halifax, that Oliver designed his equipment and brought it to the attention of the British army. His design had many supporters, including British G.O.C.s and others in Canada. In 1896, during the Venezuela Crisis, the Oliver was almost adopted by the Canadian Militia, but after a change of government a pause was taken to test it against the Merriam system and Lewis equipment. After further political manoeuvring and the direct interference of a father of Confederation, Sir Leonard Tilley, the Oliver won and began production in 1898.<sup>88</sup>

Like the Ross, the Oliver was conceptually not a bad system. It was based on an understanding that advances in technology and tactics were linked; the idea that "every soldier

should be his own magazine in battle, and it furnished each man with sufficient ammunition, rations, and clothing, including a waterproof sheet, to make him independent of the base of supplies for a 24-hour period.”<sup>89</sup> Such equipment was also supposed to be better balanced on the soldier’s body, thereby allowing more skillful individual use of terrain and concealment. Aspects of its design have been described by some authors as “ahead of their time”.<sup>90</sup>

The Oliver was produced by local manufacturers in Canada, but with failures in testing and interference in its design it demonstrated many flaws in the Boer War, chapping and choking its wearer and holding only half as many .303 rounds as British patterns.<sup>91</sup> In an attempt to use what would today be called COTS (cheap-off-the-shelf-technology), the Oliver was originally designed to carry a civilian soda water bottle which could be easily replaced, but such bottles proved far less useful and durable than British military issue ones, which eventually replaced them.<sup>92</sup> In 1902 a board of officers was created to examine ways to eliminate the deficiencies of the Oliver equipment, but it ultimately proved impossible to repair the Oliver by “cutting and sewing and changing the positions of straps.”<sup>93</sup> However, by this time the Oliver had become a “Canadian” piece of equipment, and national pride caused it to be retained in service into the First World War.<sup>94</sup> During that conflict even more sub-variants of the design would appear, which would include such components as the MacAdam shield-shovel, an entrenching tool which was to double as a shield for the rifleman but which did neither job effectively.

Sweeping and successful technological and organizational change came in the Canadian army during the First World War. During this conflict Canada developed its own general staff system to administrate its forces deployed overseas in Europe. The pressures of war and the context of mass mobilization also allowed Canadians with expertise in areas of science and technology to influence the military directly. Andrew McNaughton and Raymond Brutinel are examples of this.

After a journey of inquiry at Verdun and the Somme, McNaughton, a counter-battery officer, led investigations into how to pinpoint the position of enemy guns and then knock them out. He was joined on his staff by a number of scientists, including some who had left the British Army in irritation at its conservative attitude towards artillery. Together they developed effective flash spotting techniques and, more importantly, sound-ranging methods using oscillographs. These systems required listening posts equipped with telephones and surveying gear, as well as a series of microphones planted along the front. The devices were able to pick up the sound of an artillery piece being fired and determine its exact location by the speed with which the sound traveled. As they tuned their system, McNaughton’s group became aware of the effect of heavy winds as well as temperature and pressure changes in the air around the battlefield. This led McNaughton to spearhead efforts amongst Imperial gunners to improve the accuracy of their fire by taking into account factors such as barrel wear and wind velocity. As a result of this work many of the guns at the battle of Vimy Ridge were individually calibrated.<sup>95</sup>

Brutinel, a Montreal businessman when the war started (he had grown up in France and spent part of his life in western Canada), commanded the 1<sup>st</sup> Canadian Motor Machine Gun Brigade which was formed with the financial help of major Canadian industrialists. In 1916, with Currie’s

approval, Brutinel began to explore the use of the machine gun for various types of indirect fire, by redirecting the weapon's trajectory. Such approaches allowed the guns to be used to disrupt enemy resupply and repair efforts in their forward trenches. By being fired over the heads of one's own assaulting troops, machine guns could force the enemy to keep down in their own trenches, thus suppressing their resistance. Such uses of the machine gun were poorly understood at the time, meaning that before Brutinel the weapon was often used simply as a "super rifle" fired directly at the enemy. Brutinel's input kept the Canadians at the forefront of machine gun tactics.<sup>96</sup>

Even as the Canadian Corps grew proficient with experience using the most modern weapons of the period, it abandoned much of its specifically Canadian equipment, reverting to the old pattern of using British supplies. The drawbacks of the Ross Rifle and the Oliver Equipment have been seen above. These systems were replaced by the British Lee-Enfield .303 rifle and British Web equipment, respectively. Although under peacetime circumstances it was a step forward for Canada to experiment with its own munitions designs, under wartime conditions it was impossible to tolerate faults in equipment caused by the political concerns of the previous decade.

Continuing technological improvements were mirrored by the resolution of the firepower tactical dilemma. Under the lead first of Sir Julian Byng and then of Sir Arthur Currie, the Canadians were amongst the leading Imperial formations in fighting an effective all-arms battle. At Vimy Ridge the innovations discussed above allowed Canadian artillery to locate and destroy German guns and then smash the German fortifications, while infantry attacked in mutually supporting teams rather than in line. Currie refused to weaken the infantry strength of his divisions, and actually added more artillery, machine guns and engineers to them. Organizationally the Canadians were determined to give their infantry teams as much all-arms support as possible. The military effectiveness of this force was proven in 1918 at Amiens and after where the Canadian Corps played a leading role in decisively breaking the German army's defences on the Western Front.<sup>97</sup>

The lesson that can be drawn from Canada's experiences in the late nineteenth and early twentieth centuries is that for at least the past century and a half, armies have been adapting to almost continuous technical revolutions, often without the political and economic support they would like. The Canadian Militia, the forerunner to today's Canadian army, suffered this lack of support in an especially acute manner, because of the political and economic nature of the young Dominion. Nonetheless, military thought was active and attempting to grapple with the tactical dilemma of the day. The First World War a spur to change politically and organizationally as well as an opportunity to test new tactics in the field. Unfortunately, it did so at a significant cost in life. The lesson from this which Canadians might do well to take into the future is to retain the technical capabilities to experiment with and learn about new forms of warfare before they have to face them firsthand. In the absence of such capabilities, Canada fell back on a policy of using the military thought of Britain and other "great powers" as a framework on which to base many of its own developments. However, despite their greater resources, these powers failed to provide clear guidance.

#### Canada and the 1990's RMA

The origins of the 1990's RMA are to be found in the later stages of the Cold War. The 1950s and early 1960s were the "heyday of nuclear land battle" when Soviet forces projected advance into Western Europe through the combined use of massive nuclear firepower exploited by massed tank assault. In order to equalize their own numerically inferior forces against a Soviet advance, NATO forces also planned on the extensive use of tactical nuclear weapons to obliterate the Soviet assault waves. However, the realization on both sides of the likelihood that tactical use of nuclear weapons would quickly escalate in strategic nuclear exchange caused nuclear land battle to become a strategic stalemate. In an attempt to find a way around this stalemate, the Soviets began to consider if there was a way to quickly win a battle with NATO conventionally, without using nuclear weapons. To do so the Soviets looked back at World War II and pre-World War II campaigns and "deep war" theory which encompassed elements of what in the west would be called "manoeuvre" theory. The Soviets first tried out this old/new "all-arms battle" in Exercise DNIEPER in 1967, which was followed by what some described as a "build-up of conventional strength".<sup>98</sup> On the NATO side, reaction was delayed, but when it did come it came with the incipient elements of the RMA. The U.S. army, demoralized by the Vietnam conflict, began to experience a drive for internal reform. Simultaneously, during the 1970's concern began to grow in the West during the 1970s that Soviet numerical superiority caused by their continuing buildup of all-arms forces would allow the Soviets to win a conventional battle in Europe. Thus was born "offset theory".

Offset theory was to provide a way for NATO to balance superior Soviet quantity through improved quality. Simultaneously, it became part of a method in the minds of a new generation of American officers to reject the "attrition" warfare that they characterized Anglo-American forces as having used throughout the past and fight war in a "smarter" way. Offset strategy focused not just on better equipment, but on using Western advances in technologies such as microelectronics to change how they were used; command, control, communications and intelligence (C3I, missing only the "computer" or "computing" element which RMA theorists are fond of when they describe C4I as a major part of the RMA), and precision guidance for weapons such as rockets were all part of this.<sup>99</sup>

The other aspect of fighting more intelligently was in the Western adoption of "manoeuvre theory". This was spearheaded by Colonel, later General, Huba Wass de Czege of the U.S. Army, who had fought in Vietnam. In 1982 Wass de Czege rewrote the U.S. Army's doctrine manual FM-100-5 to emphasize use of agility, speed, avoiding frontal attacks and unnecessary loss of life and equipment, and always focusing on turning the enemy's flank in order to strike deeply into his rear areas to disrupt communications and isolate his front-line troops. Officers were to learn to think with this mindset at all levels - tactical, operational and strategic.<sup>100</sup> Most often this has been seen in NATO countries as an adoption of an evolved form of German blitzkrieg tactics, tactics which Western Allied forces only beat in World War II because of superior quantities of equipment and manpower.

In 1982 the new approaches of manoeuvre warfare and offset theory were tested out in the NATO equivalent of Exercise DNIEPER, "AirLand" Battle. In 1983, the U.S. Army Command and General Staff College created an elite one-year post-graduate program called the School for Advanced Military Studies at Fort Leavenworth, Kansas, under the coordination of Wass de Czege.

By 1991 some of Wass de Czege's students, who self-consciously referred to themselves as the "Jedi Knights", reached high-ranking positions on General Schwarzkopf's staff during the first Gulf War, Operation Desert Storm.<sup>101</sup>

Soviet analysts reacted to the developments in NATO during the late 1970s and 1980s. They predicted that a new type of warfare was emerging which would capitalize on advanced technologies to the point of eventually giving "conventional" forces the same level of effectiveness as nuclear ones. These developments would privilege the West because of its greater technological ability. In a series of papers Marshall Nikolai Ogarkov, then Chief of the Soviet General Staff, gave these developments the name of the "military technical revolution".<sup>102</sup> The Soviets were unable to put a decisive catch-up program into place because of economic weakness, followed by the collapse of the Warsaw Block and the USSR between 1989-1991. However, the concept articulated by the Soviets was taken up by Andrew Marshall of the Office of Net Assessment of the U.S. Department of Defense. Marshall and his office noted that in the current period, as revolutionary periods in the past, major changes in military capability occurred when new technologies were accompanied by changes in tactics, doctrine and organization. As a result, by 1993 they declared the term "military technical revolution" to be too narrow and argued for the term "Revolution in Military Affairs" instead.<sup>103</sup>

RMA ideas were seen by many to first appear in practice on a large scale during the 1991 Gulf War. Microelectronics-guided precision weapons made their first appearance during this conflict, and Coalition forces moved with speed and agility, for the most part fighting with a manoeuvrist style. The "Jedi Knight" mindset was one which embraced RMA developments, since such developments would further increase the flexibility and speed of forces. Nonetheless, this conflict was characterized by a massive buildup of American striking power, and a sustained air campaign before the ground army moved in, rather than a completely integrated, joint air-ground campaign. At the level of grand strategy the buildup to the operation was slow and deliberate, leading one military historian to comment that "next to Weinberger and Powell, commanders such as Ulysses Grant looked like wild-eyed gamblers".<sup>104</sup>

At a detailed level, however, it is still difficult to define the nature of what had taken place. Analysts can list off plenty of technical terminology:

New military technologies associated with the RMA include precision-guided munitions for precision force, stealth for greater power projection, advanced intelligence, surveillance and reconnaissance (ISR) systems for enhanced battle-space awareness, and advanced command, control, communications and computing (C4) systems for increased battle-space control.<sup>105</sup>

These new technologies are supposed to shift the doctrines of all services of typical Western armies. Joint doctrine is supposed to evolve, by which army units would be in constant communication with air force and navy forces, sharing intelligence and targeting information. At the more detailed level, this would mean that army units could be much lighter, and able to deploy and manoeuvre much more quickly, because instead of having to carry heavy firepower with them, they would be able to call it in from the air and navy units. Naval forces would have to trend towards littoral rather than "blue water" doctrine, in order to provide direct assistance to land forces with cruise missiles launched from warships and submarines and air strikes and transportation launched from aircraft

carriers. Air force would provide cover for both ground and sea and collect and intelligence. All of this would be facilitated by massive increases in information bandwidth provided by satellites (which would also be collecting intelligence) and Unmanned Aerial Vehicles (UAVs) which would relay this information between units in what is sometimes called the “battlecube”. Stealth vehicles would also play an increased role in both air and naval power, as would unmanned combat aerial vehicles (UCAVs). However, one might still be inclined to ask what does all this *really* mean? Up to the end of the 1990s, the picture was, as often admitted, cloudy.<sup>106</sup> The 1991 Gulf War and the 1999 operations in Kosovo were the main examples of extensive use of the new technology, but it was difficult to use either instance as a solid proof of concept for the RMA, since in both cases RMA practices were exerted in the main only through air power.

In the case of Iraq in 1991, the coalition forces used limited numbers of precision bombs - about 10% of those dropped by a number of accounts<sup>107</sup> - many of which needed to be laser-guided either by ground troops or by the aircraft that fired them. However, the ground assault was launched with heavy armoured forces which had only two or three years earlier still been preparing for massive armoured engagements on the north European plain. although Iraqi forces were numerically large, they were poorly equipped and much of their heavy equipment, such as Soviet T-64 and T-72 series tanks, had inferior range to U.S. M1A1-Abrams main battle tanks deployed. Also, many Iraqi soldiers had little desire to fight, with large numbers surrendering at early opportunities. In Kosovo and Serbia in 1999, a number of factors came together to determine the downfall of Slobodan Milosevic; significant internal opposition to his rule existed, Russia withdrew its support to Serbia at about the same time as the bombing campaign began, and during late May the Kosovo Liberation Army launched ground offensives that forced Serbian units to concentrate themselves in counterattack and defensive positions. Significantly, 80 percent of the Serbian armoured vehicles that were destroyed were destroyed during those last two and a half weeks. NATO warplanes using laser-guided ordnance were also hampered by bad weather in the Kosovo operation.<sup>108</sup>

The uncertain picture at this time was summed up by Dr. David Hall of King’s College, University of London, when he wrote that understanding the RMA and the role of Canada’s air force in it was like looking “through a glass darkly”.<sup>109</sup> Some commentators in the late 1990’s reached the conclusion that open-minded officer training and education, designed to encourage individuals to be ready to adapt to new RMA-type technologies, is more important than the immediate acquisition of new equipment which could be outdated in comparison with American acquisitions within a decade anyway.<sup>110</sup>

Around the turn of the 21<sup>st</sup> century the RMA concept was becoming increasingly nebulous, as strategists attempted to graft RMA-based technological and organizational solutions onto both high-intensity conflict (HIC) and low-intensity conflict (LIC) situations. Terms such as “3-block war”, were used to describe how to deal with future wars where HIC and LIC are combined:

In such a scenario, troops find themselves engaged in a spectrum of operations, from humanitarian missions, through peace keeping and peace enforcement-type actions, to full-blown combat - sometimes within the space of three city blocks. The success of such operations will rest largely with the "strategic corporal" - the junior leaders whose actions

and orders have, partly due to the exponential growth of the mass media, significantly increased in their geo-political influence.<sup>111</sup>

Just as the RMA began to develop in the Cold War, so did Canada's strategic situation of the 1990's and first years of the 21<sup>st</sup> century. The cancellation of the Avro Arrow project in 1959, although a decision based on logical reasons, turned the country decisively away from a policy of economic self-sufficiency and nation-building. By putting fourteen thousand aerospace workers out of a job, it helped to send a large component of them south to the U.S. and reduce the vitality of the Canadian aerospace industry. Prime Minister Diefenbaker had taken "one hard look at the costs of technological independence, quailed, and fled."<sup>112</sup>

In order to help Canada with its military procurement problems, the United States developed a formal Defence Production Sharing Program with Canada. From 1959 to 1969 Canadian defence industries became branch plants for advanced American technology, doing great business with the U.S. while Canada imported its major defence systems from that country.<sup>113</sup> Canada has remained the only country with such a formal agreement up to the present.<sup>114</sup> Similar developments in the civilian sector occurred, such as the auto pact and, more significantly, in the "high tech" sector which grew as a whole throughout North America in the last decades of the century. As a result of the above developments, Canada's technological base became very closely tied to that of the U.S. If Canada's attempts to pursue the RMA would thus be tightly linked to the American one.

This has a direct impact on the options available to Canada in the RMA today. In his paper on Canada and the RMA, Andrew Richter argued that this "branch-plant" nature weakens Canada's ability to pursue the new developments:

...there are several indications that suggest that this country has not developed a broad high-based civilian high technology base. For example, Canada features only two major computer networking companies, Newbridge Networks and Northern Telecom... Canada also features just two principal software companies, Corel Corporation and Cognos, both of which are having difficulty maintaining market share against much larger American competitors... While there are other examples of domestic Canadian technology companies competing effectively – ATI Technologies, JDS Fitel, Discreet Logic, and Spar Aerospace to name a few – all of these companies have identified niche markets in which to specialize, and thus have not produced the "spin off" effect so common in the technology industry... While IBM Canada, Microsoft Canada, Compaq Canada, and Dell Canada employ thousands of Canadians, these "information branch plants" add little to the Canadian R&D base...<sup>115</sup>

He goes on to note that Canadian R&D spending as a percentage of GDP repeatedly fell short of that in other Western countries during the 1990s, and comments on a lack of IT professionals. Since the end of the "tech boom" during which he wrote his paper, the worldwide demand for IT professionals has generally slackened, and some of the leading Canadian companies that he mentions have gone downhill while others have appeared (Nortel, for instance, has been unable to escape its disastrous slump, while Research in Motion with its Blackberry handhelds is now an industry leader). Having worked in the IT sector, this author would also argue that both Richter and perhaps Canadian

government assessments ignore the amount of genuinely innovative research which goes on in what are technically considered “branch plants” of American industry, and to what extent spin-off takes place between “branch plants” and “Canadian” companies.

DND has not ignored the importance of technology R&D; although the Defence Research Board was disbanded in 1974, the Defence R&D Branch was created in its place. In the late 1990's the branch employed around 1200 people with an annual budget of \$200 million.<sup>116</sup> However, the R&D branch spending priorities are spread between a number of areas, only some of which have a direct impact on development of RMA technology.<sup>117</sup> Overall, the accusation which has been leveled from time to time by military historians that Canadians “think tactically, not strategically” holds true in the industrial and technology sectors as well, and this may well be because leaders such as Diefenbaker have often chosen not to encourage indigenous development (even if the choice is often merely “accidental”).

What are the implications of this situation? According to Richter; Canada's mixed technology record is of particular concern considering that the Defence R&D Branch increasingly relies on the private sector for technologies that have defence applications. For example, over half of all defence research in Canada is now undertaken outside the department... While DND's model of successful private sector-military cooperation is undoubtedly the US, the relationship is unlikely to be re-created here.<sup>118</sup>

In terms of force structure, although the Canadian forces shrank numerically during the 1960's, they maintained a major commitment to NATO and the Cold War in the 1950's and 1960's. In 1969 the new Liberal government under Pierre Trudeau began major cuts to the military, arguing that the surveillance of the country's territory and coastline and the defence of North America were the most important priorities, with fulfillment of NATO commitments and international peacekeeping roles taking a secondary place. One fifth of the armed forces' personnel would be gone and many bases were closed, while in the interests of national unity social policies such as bilingualism in the armed forces.<sup>119</sup> During the 1970s and early 1980s important acquisitions, such as the Leopard I MBT and the CF-18 Hornet fighters, were made, but nonetheless the emphasis was on social policy and not warfighting capability.

In the 1980's, with a renewed chill in the Cold War and the Progressive Conservatives elected into power at the federal level, a reversal of the trends of military shrinkage and indifference to technological development was mooted. Under Perrin Beatty as Minister of Defence a new White Paper, the first since 1971, was produced, and expansion of the Canadian army to a full three mechanized divisions with expanded reserves and a strengthened air force and navy were proposed.<sup>120</sup> Beatty also proposed that Canada develop its own nuclear-powered submarines, definitely a big-ticket technology item. However, once again domestic priorities gained precedence over external commitments; after the 1989 election deficit-cutting was a priority, and with spending on such things as health care and education was far higher on the Canadian population's priority list than the military. The new acquisitions were mostly scrapped and further base closures and personnel cuts took place.<sup>121</sup>

Under the liberal federal government elected in 1993, these priorities were elevated still further. The 1994 White Paper on Defence stated:

Defence policy must respond not only to an uncertain and unstable world abroad, but also to challenging circumstances at home. In designing a new defence policy, the Government has sought to remain attentive to the very important domestic influences on Canada's defence posture and, in particular, to current fiscal circumstances.<sup>122</sup>

The point of "domestic considerations" arises repeatedly in the paper. "Most areas of defence will be cut" it states; "The relative weight of the naval, land and air establishments will be altered to allow for the transfer of more resource to where they are most needed – mainly to operational land forces. Everything is being made leaner."<sup>123</sup> The paper did, however, recognize the importance of international stability:

...the past decade has seen exponential growth in the number of refugees and of people displaced within their own countries... increasingly, armed forces are being called upon to ensure safe environments for the protection of refugees, the delivery of food and medical supplies, and the provision of essential services... Among the most difficult and immediate challenges to national security are civil wars fuelled by ethnic, religious and political extremism.<sup>124</sup>

As a result of these concerns, the paper did highlight the requirement for new acquisitions, including new armoured personnel carriers and the acquisition of a small number of precision-guided munitions for the CF-18.

In terms of doctrine, Canada appears superficially to be ahead of its allies in developing "jointness". Unification of the Canadian armed forces was carried out under Defence Minister Hellyer in the 1960's, and the country got ahead and has remained ahead of others in some aspects of integrated support to all arms of its forces.<sup>125</sup> However, as was noted in 2000 by Rear-Admiral D. Morse, commander of Standing Naval Force Atlantic, until recently "unification was, for various reasons, institutional and bureaucratic, but not operational."<sup>126</sup> While the steps taken in the 1960's largely achieved joint support and training, operations continued to be carried out along traditional service lines. Because of the nature of their tasks in the Cold War, the Canadian Air Force and Navy worked more extensively with their U.S. counterparts than with the Canadian army, meaning that to some extent different branches of Canadian service are more interoperable with related branches of other services than they are with each other.<sup>127</sup>

Another impediment to joint operations in the Canadian forces is the lack of equipment possessed by the Air Force and Navy to support ground operations. While the CF-18 possesses precision-guided munitions, no aircraft carriers are available for them as launch bases, and Canada has not had the strategic aerial refueling capability for these planes to deploy overseas without allied help.<sup>128</sup> Neither does the Canadian Navy possess warships with the ability to fire multiple cruise missiles inland. Finally, both the navy and air force do not possess the transport vehicles necessary to move Canadian troops and all their equipment effectively.

Canadian ground forces enthusiastically adopted the manoeuvre warfare doctrine of their NATO allies during the 1980's and 1990's – to quantify this claim one need only look at the number of articles that are devoted to the subject in The Army Doctrine and Training Bulletin,<sup>129</sup> or at the

doctrine manuals and training CDs used by Canadian officers today.<sup>130</sup>

In the early 21<sup>st</sup> century some elements of Canadian technology are reasonably up-to-date. The 1994 White Paper's requirement for new armoured personnel carriers was carried through with the purchase of the LAV III, built in Canada by General Motors Defense of Canada and General Dynamics Land System of the U.S. In 2001 the LAV III was also adopted by the American army as a main component of its Interim Brigade Combat Teams – “interim” because they are seen as partway to the full “RMA-ized” forces of the 2010 to 2020 period. The LAV III was seen by the U.S. Army as possessing the correct combination of protection and firepower with light weight to allow for much faster deployment than conventional armoured vehicles.

Canadian ground forces have also focused on the implementation of information dominance through implementation of command and control information systems, GPS receivers, TacOps type computer training simulations, and the Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) system.<sup>131</sup> The DND has also since 1999 released a number of strategy papers which discuss the RMA and the need for Canada to adopt RMA ideas in the future.<sup>132</sup> Many younger Canadian officers in the field are also reasonably well aware of the RMA, and have adapted their thinking to it to the extent that some of them are looking into the future to resolve the organizational problems that the new capabilities will create.<sup>133</sup> Thus Canadian ground forces have available to them both heavy equipment and digital systems similar to those of their allies.

However, many items of CF equipment, such as the well-known case of the Sea King helicopter, are reaching the end of their serviceable lives. In addition, the CF has too few personnel to support the number of overseas operations to which it is committed simultaneously with equipment maintenance and training exercises. Another reason for fewer exercises being held is a simple lack of funding. The result is that organization suffers:

Shortly after Defence Program Review 1994, collective training (brigades and battalions training in unison) effectively ceased, as a cost saving measure. The captains, majors and lieutenant-colonels in the vital positions of battalion operations officer, company commander, and battalion commander after 1995 rarely obtained crucial experience in collective all-arms training, or participated in brigade and joint (Navy, Army, Air Force) headquarters command and control.<sup>134</sup>

Under these conditions the Canadian Forces have inadequate opportunities to experiment with new technologies in the field. This is much the same problem that the Canadian Militia of the late nineteenth century suffered from. It should be noted that American strategists at the end of the 1990's were no more infallible than British thinkers a century earlier. For instance, in the 2003 Gulf War the Abrams main battle tank, which during the 1990's had come to be seen as a oversized, resource-wasting dinosaur, proved that it was still effective on an early 21<sup>st</sup> century battlefield:

The Abrams' unexpected success again proves the military adage that there is no substitute for the battlefield for finding out what works and what doesn't.

"A lot of people are going to be looking at what really happened here, instead of what was supposed to happen," says David Bercuson, director of the Centre for Military and Strategic Studies at the University of Calgary.<sup>135</sup>

The Abrams turned out to be useful in situations including combat in urban areas. "The Abrams was fantastic," a U.S. military officer said. "It wasn't new, and it wasn't sexy, but it did the job, and it kept its crews safe."<sup>136</sup>

### Conclusion

Just as Canadian Militia officers of the late nineteenth century, such as Scoble, commented on the linked technological, tactical and organizational changes of their time, Canadian analysts joined the discourse on the RMA in the 1990's. However, during both periods Canada's ability to learn about how new technologies fit into its strategic goals was constrained by lack of capabilities. The First World War demonstrated that simply following the lead of the major military powers of the time was a costly way to learn what needed to be done. In order to deal with the RMA and its follow-on ideas effectively, the Canadian Forces need to be able to return to brigade level exercises and experiment with new technology in realistic battlefield conditions. If the Canadian government wishes its military to be ready to adapt to future conditions, it will have to provide adequate funding for such learning processes.

### ENDNOTES

1. Canadian Defence Beyond 2010. Accessed April 11, 2003: [http://www.vcds.dnd.ca/dgsp/dda/rma/wayahead/intro\\_e.asp](http://www.vcds.dnd.ca/dgsp/dda/rma/wayahead/intro_e.asp)
2. Giulio Douhet. Trans. Dino Ferrari. The Command of the Air. Washington: Air Force History and Museums Program, 1998, p.
3. Most RMA theorists agree that there have been multiple revolutions in military affairs, and that these events have a number of factors in common. See, for instance: Elinor C. Sloan. The Revolution in Military Affairs. Montreal & Kingston: McGill-Queen's University Press, 2002, pp. 18-23.  
Alvin and Heidi Toffler, War and Anti-war: Survival at the Dawn of the 21<sup>st</sup> Century. Boston:

Little, Brown, 1993.

Andrew Krepinevich, "Cavalry to Computer: The Patterns of Military Revolutions". The National Interest, fall 1994.

Andrew Krepinevich, "The Military-Technical Revolution: A Preliminary Assessment, Washington DC: Center for Strategic and Budgetary Assessments, 2002.

Williamson Murray, "Thinking about Revolutions in Military Affairs". Joint Forces Quarterly, summer 1997.

Martin Van Creveld, The Transformation of War. New York: The Free Press, 1991, pp. 83-84.

Martin Van Creveld, Technology and War from 2000 B.C. to the Present, New York: The Free Press, 1989.

4. See John Keegan, The Mask of Command: A Study of Generalship. London: Pimlico, 1999, p. 170, and Van Creveld, Technology and War, op.cit., p. 173.

5. Ed. Richard Holmes, The Oxford Companion to Military History. Oxford: Oxford University Press, 2001, pp. 840-841.

6. William H. McNeill, The Pursuit of Power: Technology, Armed Force, and Society since A.D. 1000. Chicago: The University of Chicago Press, 1982, p. 231.

7. Van Creveld, Technology and War, op.cit., p. 154.

8. Ibid., p. 157.

9. Ibid., p. 158.

10. The cylindro-conoidal bullet was invented in 1823 by Captain Norton of the British 34<sup>th</sup> regiment, and taken up in France where Captain C.E. Minié gave his name to it as the "Minié ball". The Minié ball was a cylindrical projectile with a hollow base which would automatically expand and seal the bore when fired. This discussion is based on the description of firearms development in Bernard and Fawn M. Brodie, From Crossbow to H-Bomb, op.cit., pp. 131-132.

11. Also based on the discussion of firearms development in ibid, p. 135.

12. Bernard and Fawn M. Brodie, From Crossbow to H-Bomb, op.cit., 139.

13. Keegan, The Mask of Command, op.cit., p. 246.

14. Bernard and Fawn M. Brodie, From Crossbow to H-Bomb, op.cit., p. 135.

15. Van Creveld, Technology and War, op.cit., p. 173.

16. Keegan, The Mask of Command, op.cit., p. 246.

17. Ibid., p. 247.

18. See, for instance, M.A. Ramsay, Command and Cohesion: The Citizen Soldier and Minor Tactics in the British Army, 1870-1918. Westport, Connecticut: Praeger, 2002, pp. 32-47.
19. Keegan, The Mask of Command, op.cit., p. 247.
20. Quoted in *ibid.*, p. 247.
21. Quoted in *ibid.*, p. 247.
22. *Ibid.*, p. 247.
23. A good discussion of this aspect of theoretical development is to be found in M.A. Ramsay, op.cit., pp. 23-29.
24. See Bernard and Fawn M. Brodie, op.cit., p. 135, and Van Creveld, Technology and War, op.cit., p. 174.
25. Report on the State of the Militia of the Province of Canada, 1866. Ottawa: Hunter, Rose & Co., 1866, p. 8.
26. *Ibid.*, p. 9.
27. Report on the State of the Militia of the Dominion of Canada for the year 1869. Ottawa: I.B. Taylor, 1870, pp. 7-8.
28. *Ibid.*, p. 11.
29. Report on the State of the Militia for the year 1870. Ottawa: I.B. Taylor, 1871, pp. 40-41.
30. Report on the State of the Militia of the Province of Canada, 1866, op.cit., p. 9 and p. 23-25.
31. Report on the State of the Militia of the Province of Canada for the year 1867. Ottawa: Hunter, Rose & Company, 1867, p. 1.
32. Report on the State of the Militia of the Dominion of Canada for the year 1873. Ottawa: I.B. Taylor, 1874, pp. 216-223.
33. T.C. Scoble, "A Modern Battlefield". Canadian Military Institute - Selected Papers 1896-97. Welland, ON: printed by The Tribune, 1897, p. 52.
34. See *ibid.*, pp. 52-53.
35. *Ibid.*, p. 54.
36. *Ibid.*, p. 54.
37. *Ibid.*, pp. 60-61.

38. F.L. Lessard, "The Characteristics and Employment of the Three Arms, and the Principles of Attack and Defence". Canadian Military Institute – Selected Papers 1897-99. Welland: printed by The Tribune, 1899, pp. 9-22.
39. For example, Septimus J.A. Denison, "Staff Duties". Canadian Military Institute – Selected Papers 1897-99. Welland: printed by The Tribune, 1899, pp. 23-36.
40. Hubert Foster, "The Organization of an Army for War". Canadian Military Institute – Selected Papers 1897-99. Welland: printed by The Tribune, 1899, pp. 49-59.
41. Ibid., p. 59.
42. Quoted in *ibid.*, p. 68.
43. Desmond Morton, *op.cit.*, pp. 86-87.
44. See, for instance, J.L. Granatstein and David J. Bercuson. War and Peacekeeping: from South Africa to the Gulf – Canada's Limited Wars. Toronto: Key Porter Books, 1991, p. 9.
45. See, for example, Desmond Morton, *op.cit.*, p. 88.
46. See, for instance, Report on the State of the Militia of the Province of Canada, 1866, *op.cit.*, p. 6: It is quite certain that in place of the 10,000 men called for, 30,000 could have been mustered within 48 hours; and indeed when the Returns were received a few days after of the strength of the Companies on service, it was found that the number called for by the Governor General had been exceeded by 4,000 men; and that in place of 10,000 men, there were actually 14,000 doing duty with the Service Force.
- Then consider the following comments from twelve years later:  
Report on the State of the Militia of the Dominion of Canada for the year 1877. Ottawa: Maclean, Roger & Co., 1878, p. ii:  
 Owing partly to a belief in the friendly feeling, and the peaceful aspect that so happily exists throughout this great continent, as well as the absence of any symptom or cause for alarm, the idea has gradually and insensibly made itself felt that no great need exists for military preparations, and so I regret to say the Canadian Militia, though not reduced in number, yet, from the shortness of training, from the absence of any permanent or paid Regimental Staff, and from other wants and requirements of which I have given notice in three previous reports, has not improved in internal condition if measured by a military standard.
47. Richard A. Preston, The Transfer of British Military Institutions to Canada in the Nineteenth Century. Durham, N.C.: The Duke University Commonwealth-Studies Center, 1962, p. 12.
48. Report on the State of the Militia for the year 1870, *op.cit.*, pp. 14-15.
49. Ron Haycock, "Done in Our Own Country: The Politics of Canadian Munitioning". B.D. Hunt and R.G. Haycock eds., Canada's Defence: Perspectives on Policy in the Twentieth Century. Toronto: Copp Clark Pitman Ltd., 1993, pp. 46-47.

50. Carman Miller, "Sir Frederick William Borden and Military Reform, 1896-1911". B.D. Hunt and R.G. Haycock eds., Canada's Defence: Perspectives on Policy in the Twentieth Century. Toronto: Copp Clark Pitman Ltd., 1993, p. 10.
51. Granatstein and Bercuson, *op.cit.*, 16.
52. Jack Summers. Tangled Web: Canadian Infantry Accoutrements 1855 - 1985. Bloomfield, ON: Museum Restoration Service for the Canadian War Museum, 1992, p. 27.
53. *Ibid.*, p. 32.
54. See, for instance, Report on the State of the Militia of the Dominion of Canada for the year 1875. Ottawa: Maclean Roger & Co., 1876, p. xiii: "The care of arms and clothing is full of difficulties in the peculiar constitution of the Canadian Militia organization... The rifles have been in use for so long without examination by an armourer that I believe I am not exceeding the fact when I say that a large proportion of them are not fit for active service."
55. R.H. Caldwell, Butcher or Bolt: Responses to nineteenth century war in the Canadian North West in 1885. Kingston: RMC Master of Arts thesis, 1987, p. 19.
56. See, for instance, *ibid.*, p. 41.
57. *Ibid.*, p. 33.
58. *Ibid.*, p. 37. The Cardwell Reforms were an example of outside pressures, such as the rise of the middle class, factionalizing the British army. In true form as an RMA, linked technological and economic developments in the late nineteenth century changed military culture even as it changed the role of the military within society. See also *ibid.*, pp. 36-51.
59. *Ibid.*, p. 41.
60. See *ibid.*, p. 51; pp. 37-41; and p. 80.
61. Caldwell, *op.cit.*, presents a good overview of the myth, p.21.
62. Morton, *op.cit.*, p. 94.
63. Quoted in *ibid.*, p. 109.
64. Haycock, "Done in Our Own Country: The Politics of Canadian Munitioning", *op.cit.*, p. 47.
65. *Ibid.*, p. 47.
66. There were other operations as well, such as the Red River campaign in 1870, as well as many Aid to the Civil Power actions. The experiences of the NWMP could also have provided military lessons.

67. Caldwell, op.cit., p. 158.
68. For a good account of the entire campaign, as well as the battle, see Morton, op.cit., pp. 101-105, and Granatstein and Bercuson, op.cit., p. 20.
69. Bernd Horn, "Lost Opportunity: The Boer War Experience and its Influence on British and Canadian Military Thought". Bernd Horn, ed., Forging a Nation: Perspectives on the Canadian Military Experience. St. Catherines, ON: Vanwell Publishing Limited, 2002, p. 84.
70. See *ibid.*, pp. 89-92.
71. *Ibid.*, p. 93.
72. *Ibid.*, p. 92.
73. *Ibid.*, p. 94. Debates on the merits of the citizen soldier vs. the professional took place in Britain as well.
74. *Ibid.*, p. 94.
75. Quoted in *ibid.*, p. 94.
76. See *ibid.*, pp. 94-95.
77. *Ibid.*, pp. 96-97.
78. *Ibid.*, p. 98.
79. *Ibid.*, p. 98.
80. Account of this argument is based on that in *ibid.*, p. 99.
81. See: John A. MacKenzie, 90 Years and Counting: The History of Canadian Military Communications and Electronics. Kingston: Canadian Forces Communications and Electronics Museum, 1996.
82. Haycock, "Done in Our Own Country: The Politics of Canadian Munitioning", op.cit., p. 55.
83. Discussion of the origins of the Ross Rifle is based on that in *ibid.*, p. 56.
84. *Ibid.*, p. 57. Haycock also discusses this in his book on Sam Hughes.
85. *Ibid.*, p. 57.
86. *Ibid.*, p. 57.

87. This discussion of the Ross' problems is based on that in *ibid.*, pp. 57-58, as well as the author's own discussions with Haycock.
88. This discussion of the origins of the Oliver Equipment is based on that in Summers, *op.cit.*, pp. 39-42, as well as that in Haycock, "Done in Our Own Country: The Politics of Canadian Munitioning", *op.cit.*, pp. 54-55.
89. Summers, *op.cit.*, p. 42.
90. *Ibid.*, p. 78.
91. Haycock, "Done in Our Own Country: The Politics of Canadian Munitioning", *op.cit.*, p. 55.
92. Summers, *op.cit.*, pp. 42-52.
93. *Ibid.*, pp. 52-53.
94. See *ibid.*, pp. 65-84, and Haycock, "Done in Our Own Country: The Politics of Canadian Munitioning", *op.cit.*, p. 55.
95. This discussion of McNaughton's accomplishments is based on that in Pierre Berton, Vimy. Anchor Canada, 2001, pp. 163-170. No city of origin is specified for Anchor Canada, except that it is a division of Random House of Canada; the book was originally published in 1986 by Pierre Berton Enterprises Ltd.
96. This discussion of Brutinel and machine gun tactics is drawn from that in *ibid.*, pp. 170-174.
97. See, for instance, Desmond Morton, Understanding Canadian Defence. Toronto: Penguin Canada, 2003, pp. 48-49.
98. For a complete account of these developments, see Richard Simpkin, Deep Battle: The Brainchild of Marshal Tukhachevski. London: Brassey's Defence Publishers, 1987, pp. 53-77.
99. See, for instance, Sloan, *op.cit.*, pp. 25-26.
100. For a good overview of these developments, see Fred Kaplan, "Force Majeure: What Lies Behind the Military's Victory in Iraq". *Slate.msn.com*, Tuesday April 15: <http://slate.msn.com/id/2081388>
101. *Ibid.*
102. Andrew Richter. The Revolution in Military Affairs and its Impact on Canada: The Challenge and the Consequences. 1999, p. 2: <http://www.iir.ubc.ca/pdf/files/webwp28.pdf>  
See also: Elinor Sloan, The Revolution in Military Affairs, p.26.
103. Elinor Sloan, *op.cit.*, pp. 26-27.

104. Carr, op.cit., p. 277.
105. Sloan, “DCI: Responding to the US-led Revolution in Military Affairs”, op.cit., p. 4.
106. Sloan makes this point from time to time.
107. See, for instance, Fred Kaplan, “Force Majeure: What Lies Behind the Military’s Victory in Iraq”. Slate.msn.com, Tuesday April 15: <http://slate.msn.com/id/2081388>
108. See Caleb Carr, The Lessons of Terror. New York; Toronto: Random House, 2003, pp. 248-252. See also Sloan, op.cit., pp. 94-95.
109. David I. Hall, “Through a Glass Darkly: Canada’s Air Force and The Revolution in Military Affairs”. Conference of Defence Associations Institute.
110. See Stone, op.cit., p. 10.
111. Mark Burgess, “Navigating the Three-Block War and the Urban Triad”. Center for Defense Information, April 4, 2003:  
[http://www.cdi.org/program/document.cfm?DocumentID=883&StartRow=1&ListRows=10&appendURL=&Orderby=D.DateLastUpdated%20deSC&programID=69&IssueID=0&Issue=&Date\\_From=&Date\\_To=&Keywords=navigating&ContentType=&Author=&from\\_page=documents.cfm](http://www.cdi.org/program/document.cfm?DocumentID=883&StartRow=1&ListRows=10&appendURL=&Orderby=D.DateLastUpdated%20deSC&programID=69&IssueID=0&Issue=&Date_From=&Date_To=&Keywords=navigating&ContentType=&Author=&from_page=documents.cfm)
112. Desmond Morton, A Military History of Canada. Toronto: McClelland & Stewart, 1999, p. 243.
113. Ibid., p. 243.
114. Joel J. Sokolsky, “A Seat at the table: Canada and its alliances”. B.D. Hunt and R.G. Haycock eds., Canada’s Defence: Perspectives on Policy in the Twentieth Century. Mississauga: Copp Clark Pitman Ltd., p. 146.
115. Richter, op.cit., pp. 15-16.
116. Ibid., p. 13.
117. See ibid., pp. 13-14 for a discussion of this.
118. Ibid., p. 17.
119. See Morton, op.cit., pp. 254-263 for discussion of these events.
120. See ibid., p. 267.
121. See ibid., p. 268.

122. DND, 1994 White Paper on Defence, p. 10. Accessed at: [http://www.dnd.ca/admpol/eng/doc/white\\_e.htm](http://www.dnd.ca/admpol/eng/doc/white_e.htm)

123. Ibid., p. 6.

124. Ibid., p. 1.

125. Sloan, The Revolution in Military Affairs, op.cit., p. 131.

126. Quoted in *ibid.*, p. 131.

127. These points are commonly made in Canadian military intellectual circles, but Sloan has, once again, articulated them - *ibid.*, pp. 131-132.

128. The Air Force lost its strategic air-to-air refuelling capability in 1996 with the retirement of the Boeing 707; the Airbus Polaris transport will add that capability until 2004. Conference of Defence Associations. A Nation at Risk: The Decline of the Canadian Forces, pp. 24-25: <http://www.cda-cdai.ca/pdf/nationatrisk.pdf>

129. For instance, see Major Ken MacKay, “Combined Arms Obstacle Integration”, Vol.2, No.3, August 1999; Captain Michael Johnstone, “Deep Operations: The Key to Success”, Vol.2, No. 3, August 1999; Colonel Walter Semmaniw, “Manoeuvre Warfare and Leading from the Front”, Vol.2, No. 3, August 1999, and similar amounts in other volumes.

130. See, for instance, the doctrine and training CD produced by Richard Palmer; Jim Ellis; Major Tim Kilvert Jones, The Maneuvrist Approach to Operations. Visua Multimedia. CD is used by both the British and Canadian Armies.

131. See, for instance: Paul A. Roman and Bruce Chapman, “Using Simulation to Estimate the Performance of the Situational Awareness System”, Army Doctrine and Training Bulletin, Vol. 5, No. 3, Fall 2002; “From the Directorate of Army Training: Learning through desktop simulation: the rationale for acquiring a Canadian version of TacOps”, Army Doctrine and Training Bulletin, Vol. 2, No. 3, August 1999; and “From the Directorate of Army Doctrine – Firepower: A Primer for the New Manual”, Army Doctrine and Training Bulletin, Vol. 2, No. 3, August 1999.

132. See, for instance, Defence Strategy 2020: Formulating the DND/CF Statement of Strategy, at: [www.vcds.forces.gc.ca/dgsp/cosstrat/2020/dwnld/Defence%20Strategy%202020%20Ver4.doc](http://www.vcds.forces.gc.ca/dgsp/cosstrat/2020/dwnld/Defence%20Strategy%202020%20Ver4.doc) and Shaping the Future of the Canadian Forces: A Strategy for 2020, June 1999, at: [http://www.cds.forces.gc.ca/pubs/strategy2k/intro\\_e.asp](http://www.cds.forces.gc.ca/pubs/strategy2k/intro_e.asp)

133. This is, of course, an informal observation, but I have as a researcher I have “officially” questioned officers, including Captain Duncan serving with the PPCLI in 2003 on Rotation 12 of a Peacekeeping mission around Bihac, in the Former Yugoslavia. Here is part of what he had to say:

“As for the RMA that we are undergoing (or not), it's kinda tricky. GPSs are routinely used, as are SI monitors in LAVs and tanks. Our radios are now digital, which makes for some problems in terms of compatibility with other armies. I do believe we are beginning to experience an era of unprecedented situational awareness even for section and individual tank commanders. There's only one problem - info overload at both the bottom and top. This may require organizational changes to the staff systems and even the chain of command as they exist right now. That in my opinion is where the real RMA will occur. The development of GPS, new radios, use of computers etc. are not "revolutionary", but just a progression of technological advances. What may be "revolutionary" about this age is the way we have to reorganize the military thought process to balance this info overload with the need to keep the chain of command a chain (i.e. avoid micromanagement, which we now have unprecedented ability to do).” Correspondence dated April 18, 2003.

134. A Nation at Risk, op.cit., p. 17.

135. Peter Cheney, “Battlefield Final Arbiter of Weapons”. The Globe and Mail, Monday, April 21, 2003:  
<http://www.globeandmail.com/servlet/ArticleNews/TPStory/LAC/20030421/UWEAPM//?query=abrams+tank>

136. Ibid.