



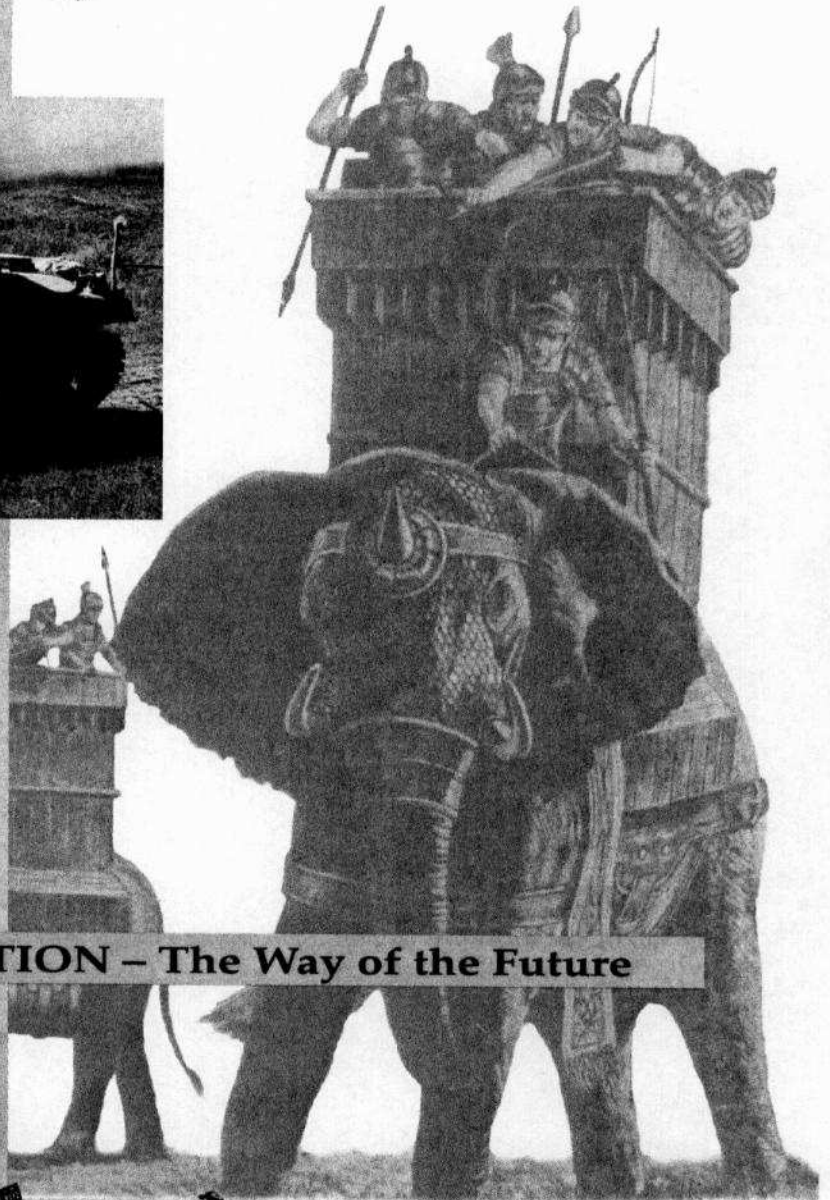
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Armour Bulletin



DIGITIZATION – The Way of the Future



Canada



Armour Bulletin

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Author's Guide

The Armour Bulletin, as a forum for debate and discussion, welcomes the submission of articles of a technical, tactical or historical nature.

The following guidelines apply:

- it would be appreciated if all articles could be typewritten on 8-1/2 x 11 paper, double spaced on one side and be accompanied by a 3.5 inch disk copy; (in WP 5.0/1/2);
- articles should not exceed 2,000 words (much smaller articles are also welcome, ie, a page or two);
- black and white photographs and illustrations should accompany the article. Photographs cut out of magazines are not acceptable as they are an infringement of copyright laws. Photographs and or illustrations add to the possibility of publishing;
- only material of an unclassified nature should be submitted;
- authors should include a very brief description of their current position, location and photo.

The Editor reserves the right to reject and to edit articles or letters submitted for publication. Authors should not submit articles which have either already been submitted for consideration to another publication or have already been published.

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About the Cover

Right illustration: Engraving depicting the tactical use of elephants circa 200 B.C. Originating earlier in India, this concept was brought forcibly to the Western military mind at the Hydaspes where both the potentialities and limitations of its use were demonstrated. Alexander The Great's horses refused to face the beasts, while his disciplined phalanx turned the elephants back in panic stricken flight.

Left photo: Sherman "Flail" tank of the Fort Garry Horse at Bretteville Le Rabet during Operation TOTALIZE, 14 August, 1944.



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Total Force

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Colonel Commandant's Foreword



It is with great pride and honour that I assume the mantle of Colonel Commandant and seek to perpetuate, indeed grow upon the accomplishments of my predecessors. The Corps and all elements of the Canadian Forces are at crossroads that will demand the utmost persistence from all of us. Together we will retain our place as a key combat arm and perpetuate the excellence we have achieved and will maintain.

The restructuring of the CF and especially the Militia will present us with daunting challenges as well as the courage to carry on. I am confident that we will remain strong within a Total Force with a mobilization mission.

I do wish to congratulate the editors for the excellence of the last Bulletin on Ethics and Leadership. That edition could well remain an excellent reference on these subjects. It was appropriate, stimulating and a good preface for those of us who attended "The Many Faces of Ethics in Defence", a conference sponsored by the Defence Ethics Program 24-25 October 1996 where the Armour Bulletin on Ethics and Leadership was given a rating of "outstanding". We are all very much aware of the importance of this subject to the Canadian Forces.

The spectrum of presentations is applauded and readers should take particular note of the subaltern's experiences in learning from the well recognized value of the accomplished NCO/WO leaders in his troop. We are all indebted for the excellent round of expressions covering all levels of leadership through to the political/diplomatic field. Human

nature does not change appreciably but it is evident that one must be ready to adapt to a continually evolving society.

While the last Bulletin concentrated on principles that are rooted in the past, this edition prepares us for the way ahead. Technological advances in informatics have resulted in phenomenal changes in the way we practise our profession. Digitization is a concept which has been embraced by other allied nations and we in the Corps must ensure that we remain cognizant of these changes in order to prepare us for future challenges.

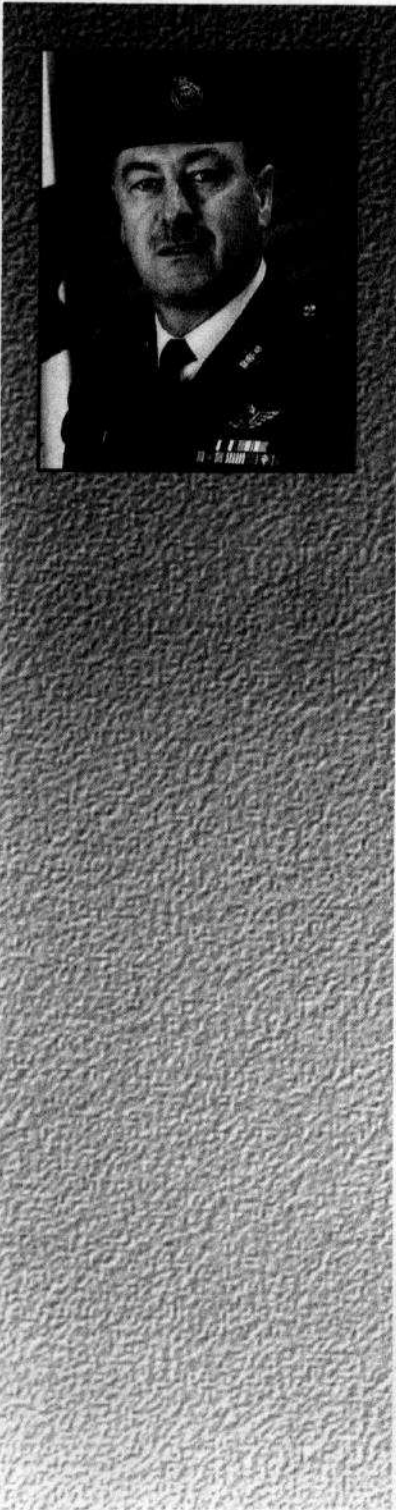
We all have comparable outlooks on what makes Canadian Armour special and we do see the Corps as particularly special and unique. The varied articles from the last edition reminded me of a 4CMBG Study Group led by the Commander who asked the four squadron leaders of the Fort Garry Horse to present their counter-attack plans; all plans presented were different but worthy of acceptance. So the contents of the Armour Bulletin are all worthy of the attention of young leaders in that privileged mission of leading our troopers into the future and possibly the ultimate task of combat. In the meantime, we all have the responsibility to practise these valuable precepts of ethics and proven principles of leadership.

Worthy!

Major-General J.P. Robert LaRose
Colonel Commandant



Director of Armour's Foreword



As this is my first opportunity to address the Corps through the medium of the Armour Bulletin, I would like to begin by stating that I consider it an honour and a privilege to have been selected as Director of Armour and to carry on the excellent work of my predecessor Colonel Michel Maisonneuve. He has served the Corps well during the past two years, and I will continue to push forward with his initiatives. In particular, his three objectives of enhancing stability, improving teamwork and protecting the core values of the RCAC remain valid and are themes which I will continue to advance. I intend to be active and visible and will visit as many units as my schedule and budget will allow.

As you are well aware, the Army has experienced a period of considerable turbulence which, unfortunately, is not yet over. The Army continues to be faced with reductions in personnel, funding and other key resources as we move towards an end state of 20,000 Regular and 18,500 Reserves, and we continue to implement many of the reduction initiatives that have previously been announced. To achieve these reductions will demand innovative approaches to how we operate on a daily basis. The Army will have to examine even more critically how it is structured, equipped and trained for the conduct of operations. In particular, Militia Regiments will be faced with a

considerable challenge over the next three years as the Army implements the Reserve Restructure Program. We must accept this initiative as a positive step forward. The three years will allow units to build on their strengths so that they can contribute in a credible fashion to the "nine brigade" Reserve structure which will evolve from the current 14 Districts. To get through this period of turmoil, we must bear in mind one of the fundamentals of armour – flexibility. If we do our work properly, the impact of change should be minimized within the Regiments so that they can continue to meet their role in training for and conducting operations. With determination and teamwork, the Corps will be able to retain its current structure in three years time. What is of utmost importance is to protect the soldiers from as much of the turbulence as possible. They are the backbone to the Corps; whatever we do should be as transparent as possible so that they can continue to perform in the outstanding fashion which sustains the reputation of the Corps.

Another area in which we will see considerable change is within the command and control structure. The army is in the process of reducing by 50 percent the size of strategic and operational level headquarters. This refers to LFCHQ and the Area headquarters staffs. LFCHQ has already moved to Ottawa, downsized, and is now referred



to as the Land Staff. Additionally, as part of the Reserve Restructure, the 14 District headquarters will be eliminated as we evolve to a nine brigade reserve structure. There will be a considerable learning curve as we develop new staff techniques that will allow us to meet our challenges in an effective fashion with a staff of only half the size.

Let there be no mistake, we are in for some difficult times. Change is never easy to implement but our challenge is to ensure that we emerge a stronger army with sufficient resources in the field force where they are needed most. Only by doing so will we be able to continue to meet our roles and tasks.

On a positive note, I can think of none better prepared than the members of the Corps to develop innovative means of dealing with these challenges. With determination, we will emerge stronger. I pledge to be there to assist, but only you can ensure success. I solicit your support.

On a separate note, I recently chaired the Armour Board in Petawawa and it was good to see a lot of familiar faces. Many pertinent issues were raised in that forum, in particular – are we training correctly? Are we getting the most bang for the buck? Are we training to need? How can we improve the way we train? I have brought these concerns to the attention of the Director of Army Training and have asked the Commandant of the RCAC School to examine the issue with the aim of determining a way ahead. I solicit your input and challenge you to be innovative in your thinking.

The Armour Bulletin is an important forum for addressing topics relevant to the Corps. I challenge you to read it, discuss it, and most importantly to contribute to it. I would like to thank all who contributed to the past edition which addressed the topical theme of "Ethics and Leadership". This has generated much constructive discussion and hopefully has inspired self-reflection for all ranks. It is a subject that bears re-visiting from time to time to ensure we retain the objective firmly in sight. If you have not read the last edition, I strongly encourage you to do so.

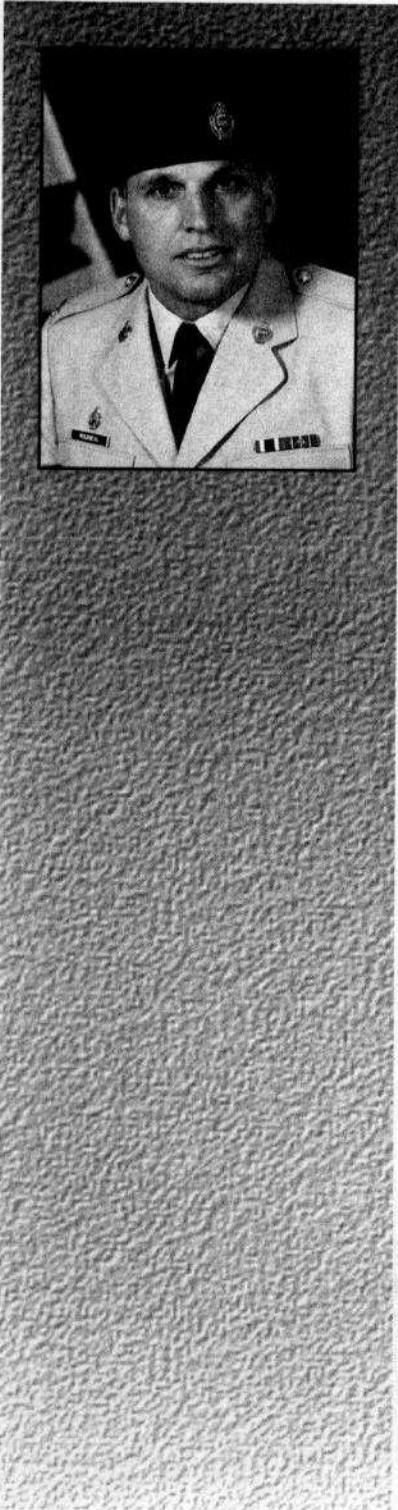
In this edition, the Editors selected "Digitization – The Way of the Future". Military operations are amongst the most complex, varied and psychologically stressful that will be undertaken by any organization. Trends towards reduced manning will almost certainly increase command stress and, due to the "fog of war," the environment will remain uncertain. More responsibility will have to be accepted by fewer people and greater trust will have to be placed in more complex automated systems. One need look no further than the recently introduced Coyote reconnaissance vehicle to see that trend. Digitization is a key initiative that will enhance battlefield awareness allowing commanders to generate faster, higher quality decisions resulting in improved control of operational tempo and improved battlefield synchronization. I look forward to reading your articles.

Worthy!

Colonel W.J. Fulton
Director of Armour



Editor-in-Chief's Foreword



Dear readers! I am again extremely honoured to introduce this second edition of the newly revamped Armour Bulletin. The success of the last edition "Ethics and Leadership" can only be measured by follow-on interest and particularly through your refreshing and at times critical comments. You will certainly agree once you have read the space dedicated to "Turret Talk" that we have achieved our aim and that there exists an audience eager to pursue such dialogue. I therefore commend those who have responded and encourage you all to contribute in future editions.

In this edition, I have invited as our "keynote writer" Col H.J. Marsh, Director of the Applied Military Science Department at RMC, to introduce the topic. He, along with his Technical colleagues have graciously accepted to familiarize us all with the vision and challenges of "Digitization". You will certainly agree that this new and irreversible phenomena has been well presented and will generate much interest. Hopefully, these readings will stimulate some thought and follow-on correspondance.

Additionally, I am extremely pleased to see our NCMs contributing to the AB. I wish this trend to continue in future editions so that we may develop a true Corps Bulletin with participation from all our components: Reserve and Regular, Officers and NCMs, serving and retired.

In closing I would like to thank on your behalf the authors of those marvellous articles which formed the previous edition and whose generous and candid thoughts gave us all great joy in reading as well as renewed our pride in those priceless traditions which form the basis of our profession and our Corps. I look forward to your comments and invite you to participate in our next edition which will focus on "The Total Force".

Lieutenant-Colonel J.W.G. Rousseau
Editor-In-Chief, Commandant
 Royal Canadian Armoured Corps
 School



Director of Army Technical Staff Course Foreword



Colonel H.J. Marsh, 126 RBC, is the Head of the Department of Applied Military Science at RMC. He is a former director of Armour, Land Requirements and Force Development.

I am the beneficiary of technology. Had it not been for medical imaging and lasers I might not be alive today. Having given technology its due, I would be remiss if I did not thank all members of the Corps who kept me in their prayers during and after my brain surgery. Thank you for your concern. Please know that being accepted, in a physically marred state, is key to both psychological and physical recovery. Continue to help others as you have so kindly supported me.

The theme of this edition of the Bulletin is "Digitization – the way of the future". I define this as the application of the binary switch to military affairs. It is but a subset of "Information Age" technologies. This shift to work based on knowledge as opposed to horsepower is challenging Canadian society. The Corps will not be exempt. For those who think that re-engineering heralded the "Information Age" and that the first shock wave is past, may I caution you that it was but a tremor. Real change is about to begin.

Two hundred years ago, between 1793 to 1815, a new form of war arose that changed strategy, command and the organizations of armed conflict. A transformation of a similar scale is upon us. The magnitude of change effecting Western states needs to be acknowledged. Technology is changing how democracies govern. Vision and leadership – the hallmarks

of Armour – will be needed as nations, governments and armies traverse the change.

To date most have been applying technology to the traditional ways of doing business. This is only natural. We have been taught to build from the known to the unknown. This has brought some efficiencies but, for the most part, technology has been held captive by our lack of understanding. We need to increase our understanding; if not, technology will intimidate. Leadership is not rooted in fear. Overcoming the fear of technology is the first hurdle.

Comprehending something new is the purview of the genius. Let us not underestimate our talent; the Corps' intellectual stock is on par with the best in academia. We have the professional intellect to shape Armour's future. Let us rise to the challenge.

As Head of the Department of Applied Military Science, RMC, Kingston I am privileged to be at the confluence of the study of science and history. From this vantage point let me outline the advancing challenges that I foresee.

"Digitization" will give rise to "Information Age" organizations and structures. Currently, headquarters are a product of the need to harness humans to process information and achieve consensus. As this task is better executed by decision support



technology, headquarters will shrink. Instead of being grouped into hierarchies, (which as you may recall is a result of a human limitation-span of command), they will co-exist with combatants. At the tactical level, commander and combatant will be one and the same. Regimental entourages will disappear.

The Armour Corps' role can be concisely expressed by the phrase, "Watch and shoot." Acquisition and accuracy are being greatly enhanced by Digitization. How the Corps decides to configure these capabilities is of immediate concern. The arrival of Coyote with a surveillance capability one hundred times greater than Lynx, quickly followed by the Armoured Combat Vehicle (ACV) whose fire-power and survivability should rival that of Main Battle Tanks, will force an organizational change if their potentials are to be realized. Combining the strengths of armour and reconnaissance in the same unit has been long advocated. What is

the blend of combat functions that permit attainment of all missions and battlefield survival within a digitized armour unit?

A revolution in education is approaching. The previous constructs of centralization, conformity and mass production are at an end. Tailor made, de-centralized training for the individual is available now. Distributed interactive training as offered by computer assisted virtual environments (CAVE) permit efficiencies and enhance tutoring. Initially it will be difficult for the Corps to trade in instructional PYs for funds to buy such a capability, but this is the future in education.

The future will be tumultuous for the militia. Any future conflict that involves mobilization will have to be achieved by "Information Age" equipped and configured units that are able to respond in hours. The militia, as well as the Regular Force, is currently far from that standard. The Reserves should

become the professional intellect; not learning to imitate the Regulars but become harbingers of future warfare.

Technology is a two edged sword. Although it saves lives it also empowers the estranged and could undermine the nation state. The technological trend is evident. Knowledge and power at even lower cost are available to the masses. Technology permits the "few" to challenge the state. How will this form of opposition be expressed? What is the role of Armour in such a scenario? These are the questions I recommend you ask while reading this issue.

Colonel H.J. Marsh
Director
Land Force Technical Staff Course



Digitization of the Battlefield: An Armoured Perspective

by Captain B. Wiens



Captain B. Wiens, LdSH (RC), is presently in the Directorate of Land Requirements as the Requirements Officer for the Tactical Battlefield Command System Project at NDHQ.

“With the required funding, we will be able to implement the vision outlined. Then, and only then, will we be able to meet the 1994 Defence White Paper’s challenge, to fight ‘alongside the best, against the best.’”

INTRODUCTION

The Vision

C/S 31 checks his Tactical Battlefield Command System (TBCS) display and notes that the symbols for his Alpha and Charlie show that they are ready in firing positions, confirming what he has already seen through the independent thermal viewer of his Armoured Combat Vehicle (ACV). He checks the boundary on his overlay orders against his own position on the digitized map of the same display and, clicking on the way point for his next fire position, gives the driver the order to advance.

As the left front troop of the Canadian Brigade in Operation Desert Shield II, he has a Partners for Peace brigade to his flank. Noting the position of their closest vehicles on his display, passed to him through their interoperable Battle Management System, he sees enemy positions appear on his digitized map, approximately five kilometres to his front. While he doesn’t know if it was his or the Partners’ call signs that noticed them, he knows that he is about to fire his first shots of this war.

His driver, having successfully negotiated the intermediate ground using the heading provided by the Position Determination and Navigation for the Land Force (PDALF) system, halts just short of a turret down position. C/S 31 coaches his driver to move up until he can observe the scene before

him. He lases the nearest target, 1500m to his front, and receives a friendly response through the Battlefield Combat Identification (BCID) system. Authorising the TBCS to pass this information digitally over the net, he lases to the other two and receives unidentified responses from his BCID. “Alpha, 31. Take the left one. Out.” As he gives the driver the order to advance, he lays on the right hand tank and presses the align button, calling out the fire order which will send a 105mm APFSDS round speeding to the target at over 1.5 km per second. Ordering the driver to halt, he yells “FIRE!” and rocks backward as his shooting war begins. Simultaneously, his other three vehicles fire and the enemy tanks explode in flames.

Seconds later, while scanning for other targets, his Laser Warning Receiver (LWR) signals that they have been lased twice. He notices on his digitized map that one of the lasers is from the Partners’ tanks and is confident that the BCID will confirm his friendly status to them. The second one is identified as the targeting laser of a Hokum! Switching his Defensive Aids Suite (DAS) to automatic, his turret slews to the heading of the Hokum, elevating to the proper range. He locates the helicopter and calls a hasty fire order, sending a second sabot round streaking through the air. As the Hokum



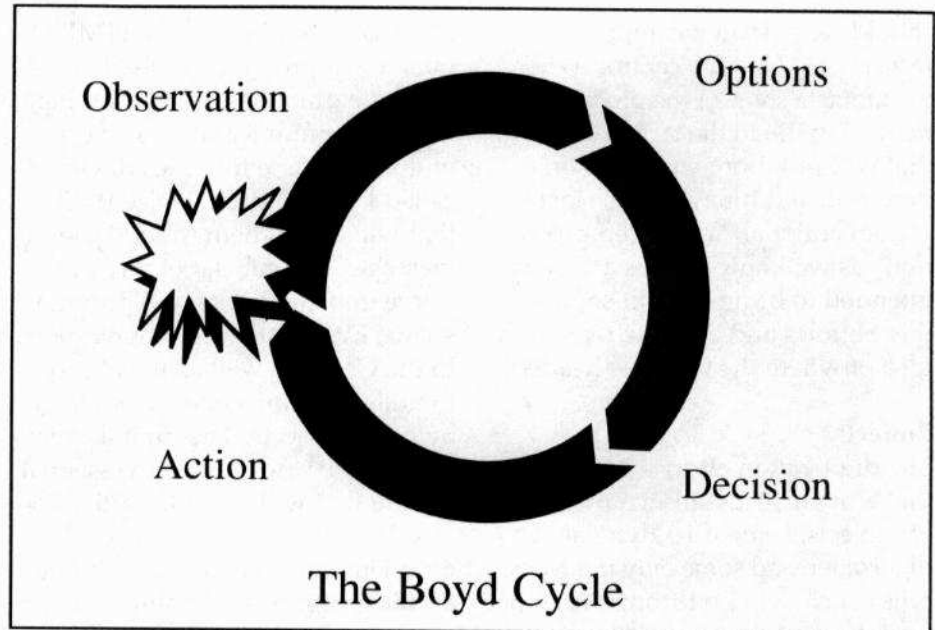
explodes, one of the protective grenades of the DAS system fires, destroying the incoming missile a scant two metres from his vehicle.

Breathing a sigh of relief, C/S 31 fills in the remainder of the contact report from pull down TBCS menus and sends it digitally to C/S 3 at the push of a button and back to the Allied HQ in seconds through the Land Force Command System (LFCS), updating the status of the advance at the highest levels of command only a few minutes after first contact has been made. He continues the advance while, transparent to him, his vetronics system registers the expenditure of two sabot rounds, checks fuel, engine, ration and water status and sends a consolidated LOGREP digitally using the Tactical Command, Control and Communications System (TCCCS) radio to C/S 39C, updating the information held by C/Ss 8, 84 and 88, and when linked with the remainder of the regiment's information, the DIS Gp.

The Reality

You may think that these are just the demented ravings of a desk bound staff officer, unconnected to the reality of the field. The reality is that if the projects mentioned above are funded, this may be the way that the Armoured Corps goes to war in 2015.

Directorate of Land Requirements (DLR) 3 (Armoured Fighting Systems), along with other parts of DLR, is sponsoring a number of projects aimed at bringing the Armoured Corps and the Land



Force into the Information Age. A number of civilian and military authors have come to the realisation that the key to success on modern battlefields is information. The acceptance of what is known as the Boyd Decision-Action Cycle (or Observation, Options, Decision, Action (OODA) Loop) as a description of the way we do business is widespread. The key to winning in this framework is speed; the ability to make better decisions than the enemy, faster than he can. One way to achieve this is to "digitize" the battlefield, linking together as much of the friendly side as possible to speed and automate the passage of information and the processing of that information into useful intelligence.

The "Canadian Land Forces Digitization Development Strategy (Draft)" defines digitization as "the integrated application of information

technologies to provide commanders with enhanced battlefield awareness". These technologies include those for the acquisition, distribution and processing of information. Many nations, notably the Americans with Force XXI, are well along the road to the vision stated above. The US will be conducting an Advanced Warfighting Experiment in spring 1997 to confirm many of the technologies required as well as testing doctrinal and tactical concepts. Canada is beginning to implement some of the same technologies and to define how we plan to use others. An emphasis will be placed, during the next five years, on the procurement of Command and Control Information Systems (C2IS) to equip all levels from the 1st Canadian Division HQ down to individual combat vehicles. This could be seen as the first phase of the "digitization" process. The next phase, in the five to fifteen year time frame,



should see a dramatic improvement in advanced land fire control systems to automate some of the processes of delivering fire to the target and DAS that will put more emphasis on detection and hit avoidance instead of conventional "armoured protection" as we know it. This article is intended to bring to light some of these efforts and give the reader an idea of where the Corps is headed.

Projects

The digitization effort within the Army is focussed in a number of projects, some directly related to digitization and some only indirectly. This article will go through each of these projects in turn, examining what they will provide and how it applies to the Armoured Corps.

TCCCS/IRIS

The Tactical Command, Control and Communications System project is a comprehensive project which aims to replace not only the combat net radios currently in service but also all other elements of Army communications. The TCCCS communication system will be called Iris and will integrate a total of 10,000 VHF vehicle installed and manpack radios, 4,500 VHF Light Assault Radios, 280 Air/Ground/Air radios, 250 Tactical Cellular radios, over 200 HF sets, a Wide Area System (formation level) as well as a Long Range Communication System based on Ground Satellite Terminal/HF (strategic level). The 524 and 125 sets will be replaced by several different configurations of VHF radios, all of which will use frequency hopping and have embedded crypto. The system will come with a Tactical

Message Handling System (TMHS), which will provide a limited set of pre-formatted messages, allowing digital communications. The users will use a single interface device, called User Control Device (UCD), that will allow them to send digital messages to a sub-set of any net. These improvements will provide secure, EW-resistant communications to the Corps as well as the ability to utilise the functionality provided by other projects. The digital capability of the new radio is an essential feature that will permit digitization of sub-units and below since all digital information processed through a TBCS must be sent using combat net radios. TCCCS will begin fielding in August 1997 and will be complete by July 2000.

PDALF

The next project which will have an effect on the Corps is the Position Determination and Navigation for the Land Force (PDALF). This project aims to supply all A vehicles of the Army with GPS and an integrated display and situational awareness (SA) package, including links to other vehicles through the TCCCS radio. The project has already purchased a number of GPS which will be installed with the system. The displays are for: the driver (depending on the available funding), showing the grid reference of current location, what way point is next for the vehicle and the distance and heading to that way point; and for the commander, showing a map grid with vehicle locations marked on it. This increase in SA will go a long way to preventing fratricide as well as speeding up operations by ensuring

that vehicle commanders are always aware of their own position as well as that of their subordinates. Subject to available funding, PDALF could provide the following: digitized maps, currently defined as 80km by 80km; the display of standard map symbols such as boundaries and minefields; the automatic filling out of TMHS proformas by drag and drop of the relevant map symbol; automatic location warnings when reaching a report line or a minefield boundary; automatic transmission of LOCREPs based on user selectable time, distance or proximity parameters; remote interrogation for the location of friendly C/Ss; ORBAT management; and a track history for all entities (vehicles, sub-sub-units, etc). PDALF is currently going through contract negotiations for the provision of the Situation Awareness Software, but has already begun fielding GPS receivers, with the full system coming on-line by October 1999.

LFCS

The Land Force Command System (LFCS) will have limited impact on the individual vehicle of the Corps but will become a major part of regimental HQ activity. LFCS aims to provide commanders and staffs at the unit and formation (Battle Group and higher) level with tools to speed up the planning process and distribution of orders, and facilities to allow for a much better real time or near real time view of the battle. While the majority of terminals will be concentrated at the brigades, the current plan is to provide a total of eight ruggedized desk top computers to each unit,



allowing local planning with the LFCS tools as well as automated passage of reports and returns to higher headquarters and automated receipt of plans and orders.

Information will flow seamlessly between LFCS, TBCS and PDALF in both directions. LFCS plans to have a contract finalized for the Spring of 1997 and should field between August 1999 and August 2000.

ACV

The Armoured Combat Vehicle (ACV) project will provide a replacement for the current fleet of Cougars at the end of its useful life. While this project is not directly part of the digitization of the battlefield, it will be the first "ready-to-digitize" vehicle brought into the Corps. The intent is that this vehicle will be purchased equipped with, or fit for, a TBCS and the latest vetronics technology to allow the easy integration of more advanced fire control and DAS as they become available and affordable. The vehicle will be a high-mobility, relatively lightly armoured vehicle mounting a 105mm gun designed to use the current stocks of ammunition. Many of the decisions about how the vehicle will look remain to be resolved but we will maintain the same tank killing capability in a highly mobile platform, better able to do the tasks set before the Armoured Corps in the post-Cold War scenario. The ACV project is in the development phase and it is anticipated that the first vehicles will be delivered in 2002.

TBCS

The Tactical Battlefield Command System (TBCS) will provide for the close combat forces what LFCS provides for formation HQs but packaged and ruggedized for mounting into a combat vehicle instead of a desktop platform. The system is conceived as a graphics based command and control tool that will include a Geographic Information System (GIS), the necessary hardware (including an advanced Human/Machine interface, possibly with direct voice entry and touch screen technologies) and software to allow creation and display of orders overlays, and integration of Situational Awareness (SA) information to assist commanders at unit level and below in knowing the disposition and condition of the forces under their command. TBCS will also provide an environment which will allow the automatic or semi-automatic generation of close combat reports and returns (such as Contact Reports, MASH Reports, etc.). The combination of these functions will allow all aspects of the battle, from planning, dissemination of orders and generation of quick attack orders to consolidation, regrouping and resupply, to proceed at a higher tempo with less misunderstanding of the commander's intent and more efficient use of air time on the radio. TBCS is entering the Development Phase with the intent of having a contract by 2001.

BCID

Battlefield Combat Identification (BCID) is based on a NATO program to provide Identification - Friend or Foe (IFF) to ground forces. The immediate solution, which Canada is implementing, involves the use of thermal panels, like those seen in the Gulf War, to assist in the IFF task. The shortcomings of this system (imitation by the enemy, accidental covering or loss of panels) are obvious and the short term solution, if NATO forces deploy in combat situations, will be to use a US sponsored active, cooperative interrogation and response system. In the long term, NATO nations have agreed to standardise on a single technology. To this end, a comparative study of various proposals from France, Germany, the UK and the US will be conducted in the summer of 1997, with the winner slated to become the NATO standard. Once this technology is selected, Canada will be able to move ahead and acquire sufficient systems to equip all A vehicles and selected B vehicles, depending on the likelihood of their requirement for the system. The scenario at the beginning of this article imagines a laser based system but other technologies are available. The ultimate solution (around 2020+) would be a non-cooperative, passive system using image analysis and SA techniques.

Vetronics

Vetronics will provide the hardware and software infrastructure which manages all of the data and power functions within designated land vehicles (primarily the ACV, and incremental improvements to the



Coyote and the new APC), and provides a gateway to the TBCS. Much of the technology used in vetronics has been developed for the aerospace industry and can be found in most, if not all, modern aircraft. The system will have sensors at each of the major sub-systems of the vehicle (engine, fire control system, fuel, ammo stowage, etc) whose outputs will be pre-processed, sent over the vetronics bus and used by the central processor to monitor the status of these components. This will provide a simple diagnostic link for maintenance as well as allowing any relevant information to be passed to other concerned parties digitally at the push of a button or automatically through the TBCS. For example, the logistic state of the vehicle including ammo, fuel and rations could be monitored by the system and passed up the

logistic chain to ensure that appropriate amounts of the required materiel is available at the next resupply. Further, monitoring of drive train systems and sub-systems could bring to light current or potential problems which can be passed to the maintenance organizations, potentially allowing parts nearing failure to be replaced before the vehicle breaks down in battle. The beauty of the system is that separate and separated systems can be linked so that, for example, the warning provided by the LWR can be passed to the FCS, allowing rapid and accurate automatic laying of the gun against the threat. Without vetronics, many of the best aspects of the other digitization systems may not attain their full potential, but with vetronics armoured fighting vehicles will become integrated systems.

CONCLUSION

The projects above, both funded and planned, represent the keys to moving the Royal Canadian Armoured Corps into the Information Age. With the required funding, we will be able to implement the vision outlined at the beginning of this article. Then, and only then, will we be able to meet the 1994 Defence White Paper's challenge, to fight "alongside the best, against the best."





"Armor" on the Digitized Battlefield

by Sergeant Major C.C. Hayhurst (USA)



Sergeant Major C.C. Hayhurst is on exchange assignment from the United States Sergeants Major Academy in Fort Bliss, Texas to the Tactics School at CTC Gagetown. He has served in all leadership positions within the United States Armor Corps.

"The advent of "Digitization" marks the appearance on today's battlefield of a new operating system that will vastly improve an armor commander's warfighting ability."

C24's Platoon Sergeant is compiling a platoon readiness report and it is 0500. Using his Intervehicular Information System (IVIS) automated situation report, he can receive and send current locations, vehicle and personnel status, and account for selected supply and maintenance items. The Platoon Sergeant will report that C23 has a fuel leak, C22 needs 3 SABOT, and C24 needs 4 HEAT. The platoon sergeant depresses the send button and his platoon leader has a complete readiness report, time 0502.

Company (Co) C is the advance guard for Task Force (TF) 1-81 Armor and 3rd Platoon has located 3 T-80's and lased onto the targets. A minute

later the Co C commander receives an automated contact report of the enemy forward defense post, and sends it in near real time to the TF commander, who through icons has the enemy position and his own front line trace.

Co C 1-81 has several wounded soldiers, the First Sergeant (Company Sergeant Major) using an IVIS MEDEVAC report sends the Battalion Aid Station information on pick-up locations, date-time group, number and priority of patients, radio frequency and call signs. The wounded soldiers will have a better chance of surviving because IVIS MEDEVAC¹ exists.

Fiction? No, this is today's "Digitized Task Force" which is now under study at Fort Hood, Texas. This article will introduce you to the newest system in the United States Armor Corps.

Digitization

The advent of "Digitization" marks the appearance on today's battlefield of a new operating system that will vastly improve an armor commander's warfighting ability. The U.S. Army Armor and Infantry Corps are currently fielding the Abrams M1A2 and Bradley M2A3 with this system. The M1A2 is equipped with the intervehicular information system (IVIS), the Bradley fighting vehicle (BFV) is equipped with a digital communications system and laser range finder. We have moved to a point where now even the basic infantryman is digitized.

This new warfighting concept currently undergoing testing at Fort Hood is called Force XXI battle command brigade and below (FBCB2)². It is not my intent to dwell on the Force XXI, however I do want to take a quick look at how Armor fits into this new approach.

The digitization system improves the armor force's capability to achieve mass at the decisive point. Digitized armor battalion automated systems are being enhanced by the Battle Command Vehicle (BCV) and Command and Control Vehicle (C2V), both of which will replace the M577. The XM4 C2V³ is built on the MRLS chassis powered by a 600hp diesel engine and is a roomy, ballistic box shelter equipped with an NBC over-pressured system



and air-conditioner. This new CP allows the armor force to maintain C2 and, when on the move, no longer takes 10 to 20 minutes to prepare for operations. Armor task forces now have digitized scouts (both mounted and dismounted) and unmanned aerial vehicles (UAV) which are used in conjunction with the digital intelligence distribution systems (which allow real time intelligence), an enhanced motor system and the new M109A6 Paladin. Other battalion systems include the Sensor Artificial Intelligence Communication Integrated Maintenance System (SACJMS) for the maintenance platoons and Telemedicine (TELEMED) for the medics. These two systems are manual and only relate to the digitized armor and infantry task forces.

Company Level

What do these improvements mean at the company level? Armor company lethality is improved in four areas: surveillance, target engagement, navigation and command and control. The Commander's Independent Thermal Viewer (CITV) allows tank commanders to simultaneously acquire targets in both primary and alternate target areas. The CITV improves the M1A2 crew's ability over the M1A1 in three areas: target acquisition (45% faster), target hand-off (50-70% faster) and 32% more accuracy in reporting enemy locations. CITV allows the tank commander (TC) to rapidly assess the situation independently of the gunner and to observe areas to the flank and rear of his tank. The Bradley

dismount squad "GIB" (guys in back) are equipped with thermal weapons sights on their personal and squad weapons which provide the squad, platoon, and company with a dismounted thermal ability.

Target engagement techniques improve at the company level with an air-ground capability, far target designation (lasing to create an enemy icon) and full ballistic solutions out to 5,000 meters (4,000 is the max. on M1A1). These improvements provide direct and indirect fire accuracy. This digitized target engagement improves company lethality and adds depth to engagement areas, while at the same time increasing the number and type of targets that are now engaged. Bradley fighting vehicles and dismount squads have lasers that allow them to engage targets at a faster rate.

Navigation enhancements improve the depth and dispersion of the armor company as well as improving their ability to effectively manoeuvre on the battlefield. The Position Navigation system (POSNAV) improves limited/night movements and will permit the commander to electronically designate waypoints which will allow platoons and companies to maintain orientation and dispersion within formations. On the M1A2 this will be accomplished by IVIS which is 96% accurate. During trials, road march time was cut 42% by the use of waypoints and the POS/NAV equipment. As for the infantry,

Bradleys also have enhanced navigation systems, including GPS and a mounted compass.

Command and control (C2) is vastly enhanced through the employment of digitized systems. Commanders can now receive, process and distribute combat data to subordinate units in near real time. A commander's situational awareness of friendly and enemy forces' locations are logged in the new system which permits increased lateral dispersion and depth within formations, thereby improving survivability and reducing fratricide. Tactical speed, logistical reporting and information between echelons also increases with the use of digital C2.

There are limitations to the new digitized system, however, the most significant being not all key combat CS or CSS units have a digitally compatible interface. Additionally, there are physical shortcomings in software and hardware, and communication nets require precise procedures and strict net discipline. While IVIS allows information to flow down the chain of command with ease, however it is rather more selective on what can be sent back up. IVIS software restricts the destination of some reports and overlays to specific routings. There is also little flexibility with messages and graphics that are available because at present computer memory capabilities are limited. IVIS technology, although very powerful is not completely mature.



Operations

The M1A2-equipped company is best employed as the lead company for the deliberate attack or advance guard, thereby permitting the tank company to exploit their unique offensive capabilities. Once contact is made, laser range finders (LRF) designate enemy locations which are relayed digitally to the commander as an automated contact or situation report. This then gives the commander a graphical representation of the location of the lead platoon and the enemy thereby allowing him to deploy the remainder of the unit to develop other situations and destroy the enemy force. These automated reports are useful for synchronizing unit manoeuvring during unexpected enemy contact such as the identification of enemy obstacles. In defensive operations, M1A2-equipped companies provide an invaluable reconnaissance and surveillance asset. As a screening force in the counter-reconnaissance role, they significantly increase the scout platoon's surveillance capability.

Gunnery

Lastly, digitization has changed tank gunnery greatly. Principles and techniques used by individuals, crews and platoons to engage the enemy have changed to support the system. One of the major changes involves tank ammunition. Previously the only rounds available to the TC were SABOT or HEAT; now the M1A2 has Multipurpose Antitank (MPAT) and Smart Target-Activated Fire and Forget (STAFF) added to the inventory.⁴ The MPAT ammunition arms 75 meters from the muzzle and sends out a radio frequency that is reflected back

to the round. The projectile in turn senses if it has missed the target while in flight and compensates by self-detonating in proximity. MPAT is also used as an anti-helicopter round.

The STAFF round is used primarily against a defiled target. When fired, it receives range data from the firing circuit as the projectile travels over the target to determine the instant it must fire an Explosive Forming Projectile (EFP) onto the top of the target.

Training

In January 1997, the 1st Cavalry Division will become the first armored division fully equipped with the M1A2 Abrams. M1A1s will be refitted to the M1A2 configuration at a tank plant in Lima, Ohio, at a cost of \$7.2 million (U.S.) each; by the year 2000, all M1A1 units will be re-equipped with the new tank system. At Fort Knox, Kentucky, tank commanders are undergoing three weeks of training to prepare for the M1A2. New tank commanders are only taught the crew stations which differ from the M1A1.⁵ The training time for a tanker coming off of an M60A3 would be nearly 90 days in duration. This training time would consist of 30 to 45 days of instruction and operation training, 15 to 30 days gunnery and an additional 30 day field training exercise. The support units and maintenance units must also receive training and new equipment to enable them to provide support to the M1A2 unit. Again the cost for this is prohibitive especially since the operational readiness rate for the M1A2 stayed at 100% during the fielding.

CONCLUSION

At the present time, I do not believe a refit of the magnitude the USA is presently undergoing is possible for Canada's Armour Corps. It seems evident that buying M1A2s from the U.S. is not likely given Canada's priorities and the fiscal restraint imposed on the Armed Forces. Furthermore, in that only units equipped with the same compatible software for single channel ground-airborne radio systems (SINCGARS) and IVIS systems are able to interact with US forces.

Unfortunately, Canada's new LAV-25 recce (COYOTE) and IVIS digitized systems cannot interact with those being trialed by US forces. In closing, both the United States Armor Corps and Royal Canadian Armour Corps must begin to jointly develop and cooperate in this field.

Footnotes

1. ST 71-2-2, St 71-1-, ST 17-12-1-A2
2. ST 71-2-2
3. Armored CAV Tom Clancy
4. ST 17-12-1-A2
5. Officer/NCO M1A2 TC Course Fort Knox KY



Digitization of Close Combat (Mounted)

by Captain V.J. Fagnan



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"The success of future digitization efforts ... will depend on our ability to harness the technology before it overwhelms us."

INTRODUCTION

After working on several Corps-related equipment and R&D projects in DLR for the past few years, I initially thought that writing an article on "Digitization of the Battlefield" would be an easy and enjoyable task. While it was enjoyable, I kept returning to the fact that "Digitization of the Battlefield" could mean anything. Digitization itself is the process of converting data into digital form so that it can be processed by a computer. I am not sure why digitization is suddenly in vogue because we have been using digital information in military systems for decades. Admittedly, digital applications in older equipment were

largely limited to parts of sub-systems such as fire control and surveillance devices. The number of systems that now rely on digital technologies, however, is increasing dramatically.

Only recently, with the explosion in information systems technologies, has there been the potential to extend the realm of military systems that could and should be digitized. The evolution of digitizing various systems on the battlefield could be compared to that of the personal computer where, in the beginning, their use was relatively basic. Now, a common home computer can be instantaneously connected to just about any other system around the world. Their potential uses are virtually endless. Using this analogy suggests that "Digitization of the Battlefield" may be heading towards the ability to connect all systems on the battlefield. While

total interconnectivity or interoperability is probably unrealistic, and perhaps even unnecessary, digitization does present some interesting avenues to the Land Force (LF).

So how does "Digitization of the Battlefield" affect the Armoured Corps and why should we care about something that may not be necessary? Quite simply, the successful management of information of the future battlefield is the only way to seriously increase our combat capability given the limitations of traditional technologies. For the Close Combat (Mounted) community, digitization encompasses all aspects of how we process and use information both within and external to our armoured fighting vehicles (AFVs). Digitization can be used to improve the combat capabilities of armoured forces at the AFV sub-system level, as well as at the force level. Processed data can be transferred between AFV sub-systems and between other AFVs or elements of different combat functions.

The aim of this paper is to discuss how digitization could improve the combat capability of armoured forces. This will be done by identifying potential digitization applications in the areas of lethality, manoeuvrability and survivability. Before discussing how digitization could be used to improve the capabilities of our mechanized forces, previous and current uses of digital technologies



will be identified. Roadblocks to actually maximizing future digitization efforts will be explored.

DIGITAL ENHANCEMENTS

Lethality

Lethality is the capability to bring effective fire to bear on an enemy. It is a function of the range, accuracy and effects of weapon systems (traditional firepower), the resolution of surveillance and target acquisition systems, and the fightability of individual and groups of AFVs. In the past, digitization of Canadian vehicles in this area was limited to basic integrated fire control systems, laser range finders and some first-generation night observation devices. Digitization has recently improved overall system lethality due to the widespread use of high resolution thermal imagers and image intensifiers, such as those on the new Coyote vehicle. Also, the marriage of navigation and fire control systems, for example, has dramatically enhanced the ability to quickly and accurately target indirect fire. Lethality will continue to improve as a direct result of innovative uses of digitization technologies.

Guidance technologies for both anti-armour guided weapons and direct fire guns are utilizing a myriad of digital techniques to improve hit probabilities. Older guided weapon systems are remaining effective by incorporating anti-spoofing/anti-decoy software in their tracking computers. Newer beam rider guidance systems, which use computer controlled laser or radar guidance to direct a round to a target, are virtually jam

and decoy resistant. In addition, millimetric wave radar seekers in tank rounds are beginning to be used to detect the final location of targets and aim explosively formed projectiles into the top armour of AFVs.

Perhaps a more revolutionary use of digital information are the developments in image processing. Most state-of-the-art day or night surveillance devices are now capable of providing digital data to image processors, which will be capable of automatic detection, and perhaps even automatic recognition of targets. Once detected, image processors would allow fire control systems to very accurately track a target, even if both vehicles are moving. These image processors and advanced fire control systems could help to reduce crew workload and reaction times, and improve system accuracy.

The fusion of data and images, through common consoles and workstations, would allow different sensors in an AFV to complement each other; transmitted to other AFVs, these images could contribute significantly to a multi-spectral, all-encompassing surveillance plan. Also, fightability of AFVs could be improved by the wide-spread use of cameras to either enhance or replace episcopes. The key to fightability, however, will be the ability to properly integrate all of the various sub-systems of an AFV into a humanly manageable package. The operator must not be treated as an integrator of systems, as is the case with most modern AFV designs, but as an integral part of the overall system.

Manoeuvrability

Manoeuvrability is the ability of a force to be at the right place at the right time. It is a derivative of the strategic, operational and tactical mobility of its vehicles, its situational awareness and its ability to communicate with other elements. Except for first-generation night observation devices, which also aided lethality, digitization has not really been used to enhance the manoeuvrability of armoured forces. More recently, however, Global Positioning System (GPS) and other navigation systems, such as the magnetic-flux compass on the Coyote, are beginning to significantly aid in the situational awareness and manoeuvrability of armoured forces. At the command level, digital mapping and terrain analysis are helping commanders better manoeuvre their forces. Improved thermal imagers used as driver's viewers are also having a positive influence on manoeuvrability.

Future trends in the area of traditional mobility include the use of active suspension, central tire inflation and diagnostic systems. Gone will be the days where we have to pull a dipstick to see if we need more oil. Numerous engine and vehicle sensors, linked to an AFV diagnostic system, could continuously monitor the vehicle's performance and determine when, for example, batteries need charging, tire pressure needs adjustment or when maintenance is required. Analog gauges and dials could be replaced by one multi-screen display. In fact, these types of displays could be used for training crews and for helping maintainers find faults.



Sharing information will also enhance manoeuvrability by improving situational awareness. The video images from drivers' thermal viewers could be shown to an infantry section mounted in the back of an APC, or the gunner's sight picture could be linked to the driver's station. With the right vehicle architecture and communication equipment, these images could also be transmitted to other AFVs on the battlefield. As an example, the obvious next step for the Coyote surveillance suite is to ensure that its imagery can be transmitted to higher HQs. The transmission of digital maps, graphical overlays and other tactical information would also greatly help a force to be at the right place quicker than relying on voice communications alone.

Survivability

Survivability is the ability to withstand the effects of the battlefield and to continue the mission. It is a function of countersurveillance, mobility, firepower, surveillance, situational awareness and protection. Traditionally, survivability was afforded by the use of passive armoured protection; digitization technologies, however, have started to complement armour protection. Currently, digital survivability on LF AFVs is being applied in the form of laser warning receivers and automatic fire suppression systems. The future applications of digital technologies in the area of survivability improvements are unlimited. Most of the revolutionary improvements to survivability will be a direct or indirect result of digitization, specifically in the area of hit avoidance technologies.

Passive hit avoidance has always resulted from small AFV sizes (note the low profile and turret size of Soviet tanks). The ability to share digital information between crew members and between sub-systems, and the fact that automatic loaders are becoming more common and reliable, will allow for smaller AFVs. As a result of computer aids and better fightability features, tank crew numbers could be reduced to three or even two. Remaining crews could be placed in the hulls of vehicles for better protection and low-profile, turretless and overhead main guns could become commonplace.

Systems that improve the level of situational awareness will also help to improve survivability by providing a degree of combat identification (Cbt ID). Furthermore, dedicated positive identification Cbt ID systems, such as laser interrogators or millimetric wave transponders directly linked to fire control systems, will also increase the level of the survivability by reducing the incidents of fratricide.

Until recently, most survivability enhancements have been modular in nature. A direct consequence of digitization will be the ability to integrate all aspects of defensive aid suites (DAS) for AFVs. That is, all sensors, displays, threat assessment tools and crew commander's decision aids could be linked to various automatic, semi-automatic and manual countermeasures. Sensors such as high resolution laser warning receivers, radar warning receivers, muzzle flash detectors, acoustic detectors and gun sights could help trigger

countermeasures such as active armours, decoys, jammers, obscuring, false target generators and even return accurate fire. An AFV DAS, linked through a communication system to other elements of a force, could improve the survivability of the force itself by enabling automatic contact reporting and the launching of other attack or countermeasures.

"Contact, Roadblock, Wait Out!"

There are many applications of digitization that could be used to improve the combat capability of armoured forces in the areas of lethality, manoeuvrability and survivability. I am sure that every reader identified numerous roadblocks that could prevent achieving these types of enhancements. The list of roadblocks is endless. How we get through, or hopefully avoid, these roadblocks will determine the extent of the success of future digitization efforts. The LF has currently identified elements of most of the above capability improvements and is investigating many of these areas in its R&D and capital equipment projects. There should not be any reason why the varying degrees of digitization discussed cannot be achieved. The biggest roadblock that we face is not that we don't have the money or understanding to develop these types of systems, but that we are not approaching the development of these systems from a system's perspective and with an open mind.

Although the individual improvements to the capability areas will be important, the key to success will be how the components and sub-systems share digital information



and how the information is actually managed. In order to gain the most from these techniques, several enabling systems will be required. New types of vehicle infrastructure will allow power and digital data to be shared, stored and managed within a vehicle. This architecture is commonly referred to as Vetronics (vehicle electronics). In addition, there will be a requirement to transmit, store and manage different types of data external to the AFV. This will also come with its own overhead in terms of a battlefield management/command system and other communication information systems. All of these systems cannot be developed in isolation: they must be developed as part of one overall plan. This is not necessarily the case now as various project time lines do not seem to match. The new APC, for example, will be fielded long before the Vetronics or Tactical Battlefield Command System projects are well underway. In order for digitization methods to become truly optimized, new systems must be integrated into, not bolted onto, existing ones.

On a more micro level, a systems approach means that human factors engineering must be mandated in every new project. Human factors engineering represents not only the physical operator-machine

interface, but helps to ensure that 'our soldiers, with a specific amount of training, can complete the desired tasks, to an appropriate standard, under defined operational conditions. Too often, the systems are not really designed with the operator as an integral part. The end result is that we try to train away any usability problems rather than developing systems that are easy to operate without any special training. As a user, the key is to become involved from beginning to end of all new developments.

To illustrate that we are still very narrow-minded about digitization, most discussions about the new Armoured Combat Vehicle return to the traditional wheel versus track argument, rather than praising any of the items that will significantly improve our capabilities as a direct consequence of digitization. In addition, we tend to be too cap-badge oriented. We should be thinking in terms of the combat functions of Close Combat (Mounted) and (Dismounted), rather than Infantry and Armoured. Digitization applications may be somewhat different for these two functions, but there should be no difference between mounted "infantry" or "armoured" operations.

CONCLUSION

Digitization has, is and will continue to benefit the combat capabilities of armoured forces despite some roadblocks. The lethality, manoeuvrability and survivability of armoured forces can be improved in many unique ways by applying nothing more than novel digital technologies. The possibilities are as endless as our collective imaginations. The success of future digitization efforts, however, will depend on our ability to harness the technology before it overwhelms us.

In order to gain the maximum potential from future digitization efforts, a systems approach must be adopted. Both R&D and capital projects must be pursued with common goals and time lines in mind: future systems cannot be developed in isolation. Developers must also be sensitive to the fact that the human operator is an integral part of the overall system and plan for user involvement from the onset of a project. We should learn and understand the capabilities and limitations of digitization technologies, but in the end, we must keep an open mind as digitization is already starting to encompass all aspects of how we manage information on the battlefield. ■



Bridging the C2 Doctrine – Technology Gap: A Digitization Concept for the Canadian Army

by Major G.T. Vienneau



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"The aim of digitization would be to provide Canadian Army commanders with enhanced battlefield awareness by increasing the volume, accuracy and speed of battlefield information made available to them."

Military Application of Technology

Throughout history, army operational concepts, doctrine and force structures have undergone profound changes, owing in part to technological breakthroughs (e.g., gun powder, machine gun, tank). However, the application of new technology will generally take one of two forms. The first and most frequent is where a new technology or group of technologies is used to create evolutionary enhancements in operational capability and thus warrant little

or no change to existing operational concepts, doctrine or force structure. Evolutionary enhancements generally come in the form of upgraded equipments/systems that essentially perform the same doctrinal function as the equipments/systems they have replaced. Unfortunately, the evolutionary application of a new technology often results in a doctrine-technology gap, as the new technology is constrained to operate within existing operational paradigms and its operational potential is seldom fully exploited. For example, prior to World War II, the French Army used an evolutionary application of tanks by employing the technology within infantry-based doctrine and dispersing France's tanks among existing infantry units.

The second and less frequent form of technology application is where

a technology or group of technologies is used to create a revolutionary enhancement in operational capability, resulting in significant change to existing operational concepts, doctrine and force structure. In essence, the doctrine-technology gap is bridged by creating a new operational paradigm. For example, unlike the French Army, the German Army more fully exploited the operational potential of tank technology, modified their existing operational doctrine and created a revolutionary enhancement in combat capability by concentrating Germany's tanks within newly formed Panzer divisions.

Information Age Gap

In their book, *War and Anti-War*, Alvin and Heidi Toffler applied their wave analysis theory to describe the revolutionary impact that the information-based "third wave" will have on warfare in the 21st Century. Futurists speak of cyberwar and the belief is held by many that Armies are experiencing an information technology based "revolution in military affairs" (RMA). In response to advances in information technology and based on the success of such technologies in the 1991 Gulf War, Force XXI was created by the US Army as a force development initiative to transform itself from a Cold War, Industrial Age army of the 1980s, to an Information Age army of the 21st



Century. In essence, with Force XXI, the US Army is bridging its doctrine-technology gap by choosing to use a revolutionary versus evolutionary application of emerging Information Age technologies. Other armies have launched their own transformation initiatives – for example, the US Marines with “Sea Dragon” and the Australian Army with “Army 21”.

Within the Canadian army, a doctrine-technology gap is becoming apparent as increasingly capable Information Age technologies are being implemented in an evolutionary manner within Industrial Age-based doctrine and force structure. For example, projects such as the Tactical Command Control and Communications System (TCCCS), Position Determination and Navigation for Land Force (PDALF) and Light Armour Vehicle Reconnaissance (LAV Recce) will deliver leading edge Information Age technologies. However, the operational impact of these projects will be constrained by the fact that their fieldings will occur without prompting any major change in current Canadian army doctrine and force structure.

In order to bridge its doctrine-technology gap, the Canadian army should follow the example of several of its key allies and initiate a broad force development initiative to transform itself from an Industrial Age-based force to one that is more suited to the challenges of the 21st Century. This transformation initiative should consist of developing future operational concepts, doctrine and force structures. In support of this

transformation, the Canadian army should assess and exploit a wide range of enabling technologies (e.g., information technologies, non-lethal weapons, advanced materials, biotechnology, robotics, propulsion, etc).

Digitization Bridge

Digitization can be thought of as the process of integrating information technologies that support information acquisition (e.g., sensors), distribution (e.g., communications) and processing (e.g., information systems). Within the US Army, digitization has emerged as a process to bridge the doctrine-technology gap between emerging information technologies and US Army command & control (C2) doctrine. Digitization has the potential to provide the same C2 doctrine-technology bridge for the Canadian army by integrating the information technologies of upcoming equipment projects with the Canadian army’s future operational concepts, doctrine and force structure.

The aim of digitization would be to provide Canadian army commanders with enhanced battlefield awareness by increasing the volume, accuracy and speed of battlefield information made available to them. Due to the “fog of war”, commanders will continue to command in an environment of uncertainty and compelled to make maximum use of their knowledge, intuition and experience. However, enhanced battlefield awareness would allow commanders to generate faster, higher quality decisions resulting in improved control of operational tempo and improved battlefield synchronization.

In the shorter term, the application of digitization technologies offers the opportunity for the Canadian army to enhance the integration of sensor, communication and C2 information systems. Therefore, initial digitization efforts should concentrate on the integration of current and near term communication and C2 information system projects (e.g., TCCCS, Land Force Command System – LFCS, PDALF) and weapon/sensor system acquisitions (e.g., LAV Recce, APC Replacement Project, soldier systems). In the longer term, the way in which forces are commanded in the Information Age may be fundamentally different from today’s Industrial Age concepts and therefore digitization may result in the development of new C2 concepts and doctrine.

To fully exploit the potential of information technologies, the Canadian army’s digitization efforts should be guided by the following principles:

- a. **Doctrine Based.** In order to remain operationally relevant, digitization efforts should be based on the evolving doctrinal concept of “Information Operations” and its goal of battlefield information dominance;
- b. **User Driven.** Digitization efforts must be driven by the requirement for commanders to have battlefield information that is accurate, timely, relevant, collated and presented in a format that will facilitate decision making. Commanders need to be empowered with information, not overwhelmed by it, and they need to make better decisions, not just faster ones;

c. **Team Approach.** Priority must be given to establishing a clear operational focus for digitization and utilizing a team approach that will result in maximum synergies among concepts, doctrine, engineering, requirements, operations research and R&D staffs;

d. **Common Foundation.** Fiscal realities necessitates that the Canadian army's digitization efforts build on a common foundation consisting of TCCCS as the army's battlefield communications infrastructure, LFCS as the army's common core C2 information system capability and PDALF as the army's common core position determination/navigation capability;

e. **Exploitation of Space Systems.** The Canadian army should exploit the communication, sensor and surveillance capabilities offered by space systems. In addition, these space systems should be fully integrated with their ground-based counterparts;

f. **Joint Interoperability Standards.** The Canadian army must acknowledge the operational imperative for joint interoperability and by extension, digitization efforts must comply with the Department's joint interoperability standards; and

g. **Architectural Control.** To achieve interoperability among its sensor platforms, communication networks and C2 information systems, the Canadian army should establish architectural control by defining the operational interoperability requirements, establishing technical interoperability standards and mandating system integration guidelines.

CONCLUSION

Historically, the evolutionary application of new technologies has resulted in doctrine-technology gaps, as emerging technologies are constrained to operate within existing doctrinal paradigms. Today, the evolutionary application of emerging Information Age technologies is resulting in a C2 doctrine-technology gap within the Canadian army. Digitization offers a means of bridging this gap. However, digitization should occur within the framework of a broad transformation initiative to fully exploit all enabling technologies and develop future operational concepts, doctrine and force structure. Key to the Canadian army's digitization efforts will be not only the integration of diverse sensor, communication and C2 information systems, but more importantly the integration of information technologies with the operational vision of the 21st Century Canadian army.





Digitization of the Battlefield: Will Technology Make Directive Control Obsolete?

by Captain M. Novati



Captain M. Novati, RCD, is currently the Gunnery Standards Officer at the Royal Canadian Armoured Corps School.

“Commanders at all levels will conceivably be subjected to varying degrees of ‘Information Overload’. The lower level commanders (Troop/Platoon and Squadron/ Company) will be particularly susceptible.”

“In the term ‘Manoeuvre Warfare,’ manoeuvre (sic) refers to an entire style of warfare, one characterized not only by moving in relation to the enemy to gain positional advantage, but also – AND EVEN MORE – to moving faster than the enemy, to defeating him through superior tempo.”¹

The potential capabilities offered by Digitization of the Battlefield that will in turn, produce a ‘superior tempo’ are mind boggling. However, I think there is also a potential downside; and that is the possible

superfluousness of some of the lower levels of command. This article will explore that possibility.

One of the tenets of manoeuvre warfare is Directive Control. That is to say, subordinates are given a mission, including how it fits into the commander’s overall aim, and then allowed to determine the best way to achieve that mission. This permits those individuals closest to the actual fighting, and therefore with the most up to date information, the freedom to make decisions as the situation changes. The opposite is known as Detailed Control and is where subordinates are given specific instructions on what to do and how to do it. Although this has the advantage of unity of command and effort, there is little room for tactical flexibility at the lower levels of command.

Up until recently in modern warfare, no technology has been able to allow commanders to ‘see’ the battlefield from the rear. Successful commanders have always been ‘up front’ at a decisive point from which they could personally observe the battle and therefore issue timely orders which could influence its outcome. Digitization, in the form of the Global Positioning System (GPS), Enhanced Positioning Location Reporting System (EPLRS), Interverhicular Information System (IVIS), Situational Awareness Terminal (SAT), and Tactical Satellite Communications (TACSAT), all of which are currently in service with the American army and with GPS at least, just being introduced in the Canadian army, will likely change all that.

A major aim of the digitization effort is to integrate all the data from the various ‘stovepipe’ systems already in use or due to be adopted. This will allow horizontal as well as vertical passage and access to information. Any ‘user’ on the ‘net’ can therefore access data from any level provided it is somewhere in the system. For example, a Brigade G3 can have instantaneous updates to locations, strengths, and states of subordinate units and sub-units in order to better plan for future operations. Likewise, he will no longer have to wait for the Dispatch Rider (DR) to deliver the Divisional Trace, it will be available ‘on line’ as soon as it is prepared.



Commanders at all levels will conceivably be subjected to varying degrees of 'Information Overload'. The lower level commanders (Troop/Platoon and Squadron/Company) will be particularly susceptible. Due to the limited space in a tank or APC, these commanders do not have the luxury of a large video terminal to display the reams of data or the 'staff' to help process it all. At Battalion/Regimental and higher levels, there are Command Post (CP) complexes with ample room for multiple large screen monitors displaying information such as a very accurate digital maps with the location of individual tanks and APCs superimposed (as icons), digital photos or 'real time video' 'burst transmitted' from forward recon elements or even Remotely Piloted Vehicles (RPVs), and the latest Intelligence Summary (INTSUM) from any higher level just to name a few. There is also room for several individuals ('Staff') to manipulate the equipment and selectively draw on the available data. This would allow a commander to enter a CP and personally process the graphically represented information and make timely decisions and then 'Download' those decisions to the applicable level of command; possibly, in the interest of speed, by-passing intermediate levels of command. While the same information would be available to the lower level commanders, the physical limitations imposed by their cramped quarters will not allow them to simultaneously access all the information required to make an informed and timely decision.

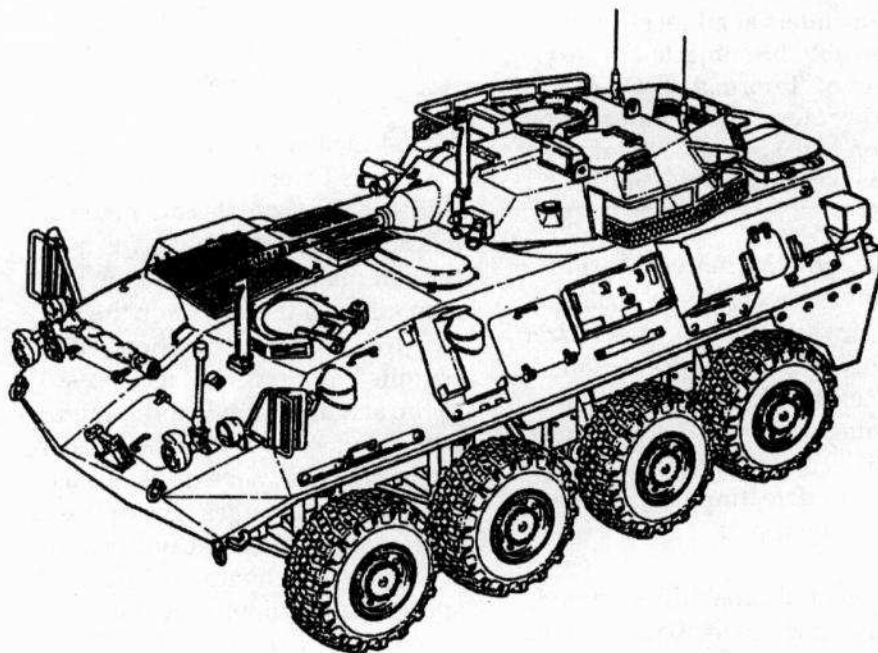
Therefore, a Battle Group commander for example, could conceivably be in a better position from his CP to manoeuvre individual Troops and Platoons, and possibly even individual tanks and APCs, than the Combat Team commander could from his vehicle 'up at the front'.

While it is felt that there will always be a place for Troop Leaders and Platoon Commanders as well as junior and senior NCOs to provide the personal leadership and inspiration that so often leads to success even against overwhelming odds, the potential of emerging technologies begs the question "Will 'Directive Control' become obsolete?" take this a step further and does this lead to the Combat Team Commander

or any other level of command being superfluous and/or redundant? While I am still undecided on the question, I am sure that the possible consequences of 'Digitization of the Battlefield' or 'Warfare in the Information Age' should be at least identified and debated. We, as a profession, must be open minded to new technologies and be ready for the changes in doctrine, tactics or procedures that they may bring. What not so long ago would have been considered the stuff of science fiction, may soon be installed in our AFVs and CPs.

Footnotes

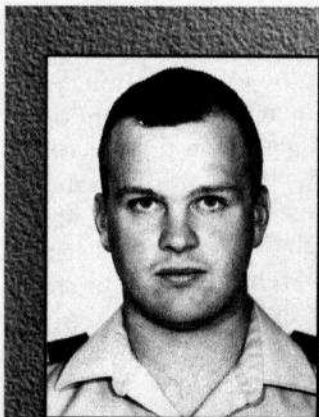
1. Lind, William, "The Theory and Practice of Maneuvre Warfare," *Maneuver Warfare: An Anthology* (New York: Doubleday) 1994





Hasty Breaching of the Technological Gap

by Captain D.J. Senft



Captain D. Senft, LdSH (RC), is currently posted as the G3 Training Coordinator at Headquarters 1 CMBG in Calgary.

“Effective employment of technology coupled with individual crew skills is the key to success and ultimately victory on the modern battlefield.”

At present, our Corps is equipped with a reliable yet dated main battle tank, the venerable Leopard C1. The Leopard, although no longer on the cutting edge of technology, does provide our crews with the basis of armoured skills required on the modern battlefield. With the Leopard we are able to train in a tracked vehicle with a 4 man crew using computer assisted fire control systems to engage targets static and on the move. By simply crewing, maintaining and training on the Leopard on a day to day basis, soldiers acquire skills common to any main battle tank in the world today. What is missing however, is the specific technical training required to keep our soldiers current on 2nd and 3rd generation

Main Battle tanks. Without the capability of training our crews on new technologies and techniques, we run the risk of fading into obsolescence.

Effective employment of technology, coupled with individual crew skills, is the key to success and ultimately victory on the modern battlefield. It is this gap in training, coupled with an examination of our tactics and training, that I will be discussing in this paper.

Countless after action reports from conflicts throughout history, and most recently the Gulf War, clearly highlight the confusion and chaos that typify a modern high speed battle. The key to not only surviving, but emerging victorious on any battlefield has been identified as the ability to quickly acquire and accurately engage enemy targets with first round kills. The ability

to engage targets through the haze of confusion of battle and achieve a first round hit first is the key to success. The basis for this ability is a well rehearsed and highly trained crew. But what will set the winners apart from the losers in these situations is not only the best crews, but the best equipment.

Our highly trained crews must have at their disposal the means to acquire targets through smoke and haze, laze through this same obscuration, and engage the target quickly and accurately. Clearly, the Leopard affords Canadian crews the opportunity to train and rehearse their skills. However, it's equally as clear that our tank, with its ND-YAG laser and Image Intensification NFCS, cannot meet the technological requirement. Smoke and dust, the most common factors on any battlefield, are capable of effectively negating our ability to locate, engage and destroy our enemy. We must, if not upgrade our tanks with CO2 lasers and thermal imagery, train our soldiers in the application of this technology.

A course of study must be developed to ensure that our soldiers are trained in the operation and maintenance of this technology. Recent acquisitions of 2nd generation thermal sights like the NODLR would afford crews the opportunity to at least train with a thermal sighting system, familiarizing them with the available technology, and most importantly,



aid in the development of thermal AFV recognition awareness so crews hone their ability to identify both enemy and friendly AFV's. Another solution would be to make more frequent use of facilities such as the SIMNET at Ft Knox, or schools such as the Combat Vehicle Training Transition Teams at National Guard bases in the US. The CVT3 teams are mandated to convert guardsmen from the M60A3 to the M1 and M1A1. Vacancies exist on these courses, and due to the similarity between the gun and fire control systems of the M60 and Leopard, this presents an excellent opportunity for our soldiers to gain exposure to the next generation of MBT. The purchasing of currency training coupled with the training afforded by crewing the Leopard would ensure our crews remain capable of functioning and surviving as tankers on the modern battlefield. What must be weighed is the cost of purchasing this training as opposed to either upgrading the Leopard or purchasing new 2nd or 3rd generation main battle tanks. Although the Coyote and its modern equipment will shortly be introduced to the Corps, the Coyotes' recce role will not aid in overcoming the shortfalls of current tank technology and tactics training.

The recent emphasis on the AVGP due to UN operations has seen a further degradation of tank crew skills. The AVGP has been employed in the recce role in each of the operations it has supported. The result has been an emphasis on recce training and tactics that has further eroded the pool of experienced and skilled tankers within the Corps.

The former Director of Armour, Colonel Maisonneuve, has highlighted this shortfall in his forward to the most recent edition of the Corps Bulletin, stating that "the state of our general purpose armoured training has suffered and needs to be our focus for the future."¹ With the priority of effort leaning towards the AVGP in the recce role, and in the very near future the Coyote, the tactics of modern tank warfare are waning along with our technological training. Not only are our crews devoting a great deal of time to recce tactics and the AVGP, but Sabre Squadron tactics are also quickly becoming outdated.

Radical tactics such as hunter killer and rolling overwatch are the reality of modern armoured warfare, and yet are found nowhere in current Canadian doctrine. A tanks sole purpose is to kill enemy tanks. Most modern tanks are devoid of gun clinometers, traverse indicators and HESH ammunition as they have a very limited defensive role. Sabot and Heat fired on the move in the advance maximizes the firepower, flexibility, protection, mobility and shock action of the main battle tank, characteristics taught but not well rehearsed.

Coupled with an examination of our tactics, we must also re-examine the ancient taboo of never combining tactics and gunnery. This is an outdated practice that fails to fully prepare our crews for the modern battlefield as the two must be fully integrated to fully prepare our crews. The US Army Table XII firing program is an excellent example of how the two functions can be combined. Troops are taken through a com-

plete tactical scenario, which requires detailed planning, tight fire control, exacting attack plans and strong communication between callsigns. As crews progress, additional scenarios can be included, including the loss of various pieces of equipment (thermal sight or computer sights) or the loss of a crew member requiring a three man engagement possibly even in TOPP High. Contingencies such as this are not rehearsed by our crews, yet they are common occurrences in modern battle. Units must get maximum value for the limited ammunition they receive, and typically it must be devoted to ensuring gunners and crews complete the current rigid firing tables. Due to the lack of ammunition no opportunity exists to conduct this specialized contingency training at present. In a realm of shrinking budgets, the requirement for resources to maintain the established standards must become a priority.

The Corps is in a constant battle with the other Arms for funding to support our training and modernization, and increasingly we are seen as an outdated money pit that cannot be easily and inexpensively brought into the 21st Century. Our crews must remain current in both technology and tactics to convince the other Arms of our absolute necessity on the battlefield, by clearly demonstrating the superior mobility and firepower we offer the modern all arms team.

For this reason, it is also essential that caution be exercised as the Coyote joins our fleet. The Coyote will offer the Infantry a highly mobile and accurate direct fire



support vehicle within their own Battalions. The 25mm fully stabilized weapons system will allow the infantry to provide their own intimate support when and where needed with a high volume of very accurate fire. The acquisition of this new vehicle, while intended to serve in the recce role, will make it even more difficult to justify our existence, and more importantly to ensure we receive a sufficient share of the training and equipment budgets.

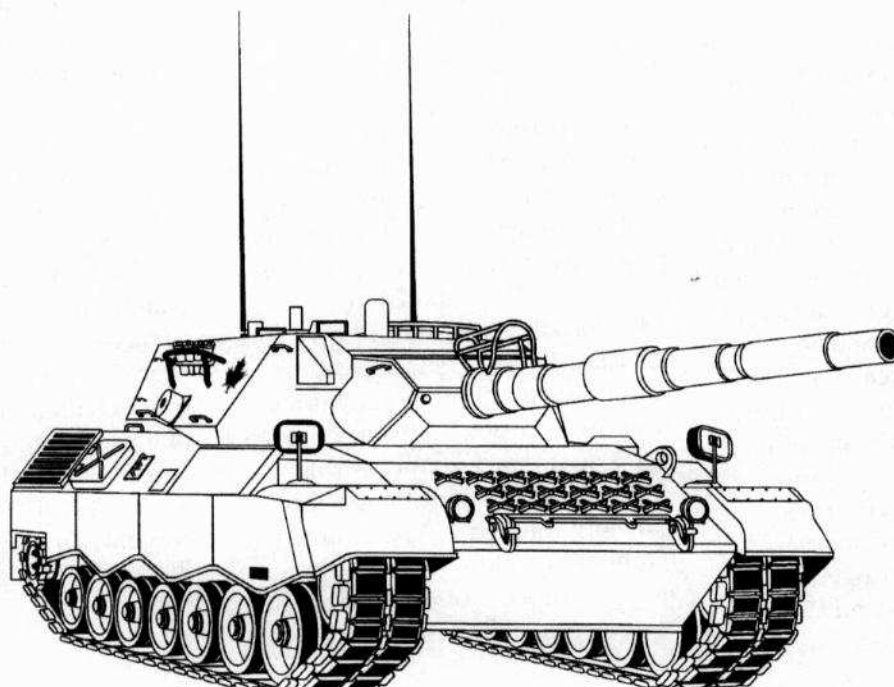
In summary, it is futile to think that our current main battle tanks would be employed in the role for which they were designed on the present day battlefield. Regardless of crew training, our troops would be stabbing blindly into the darkness, unable to acquire targets, and with a very real possibility of fratricide as target definition would be extremely difficult. This, coupled with the fact

that the Leopard could not survive a direct hit due to its thin armour and its outdated "in turret" ammo storage clearly takes the Leopard out of contention as a "modern" main battle tank. These facts, coupled with the cost of replacing or modernizing the Leopard, have brought the Corps dangerously close to extinction. We are fast approaching a critical juncture in the Corps development. In order to survive, the Corps must strive to close the technology gap by whatever means possible and ensure that we continue to adapt tactically to the demands of the modern battlefield. There are many low cost methods utilizing current Canadian equipment such as the NODLR, as well as more creative and rewarding opportunities in the US that would enable technical training to take place. We ignore these changes in technology at our own peril, with the very real risk of fading into obsolescence.

Tactically, we must strive to create realistic tactical scenarios for gunnery training that encompass a broad spectrum of contingencies and radical tactics. The Leopard, in its current configuration, will enable crews to employ these new tactics, concentrating on the offensive role and making full use of our arms characteristics. The use of our tanks as offensive weapons that defeat the enemy through the aggressive use of firepower and battlefield mobility will allow our soldiers to train for the current armoured battlefield. We cannot afford to mark time any longer...
Driver Advance.

Footnotes

1. Director of Armour's Foreword – Armour Bulletin Volume 29 No 1 1996.





Strategic Datalink: Armoured Fighting Vehicles (AFV), Canadian and International Security

by Colonel H.J. Marsh



Colonel H.J. Marsh, 12e RBC, is the Head of the Department of Applied Military Science at RMC. He is a former director of Armour, Land Requirements and Force Development.

"Since the end of the Cold War the proliferation of high technology weaponry once reserved for NATO or Warsaw Pact countries is now available in most arms bazaars at bargain basement prices."

It was with some relief that serving army officers read that Canadians are internationalists and not isolationists in the 1994 White Paper. They were encouraged that the government made a public commitment to adequately equip the operational land forces and near ecstatic to see in print an acknowledgement of, "...a recognized operational deficiency in the armoured personnel carrier fleet." and the need to replace, "...the army's close combat, direct-fire capability in peace and stability operations..." To those conversant with policy speak this means the Canadian army Armoured Fighting Vehicle (AFV) fleets of M113s and Cougars are about to be replaced.

The August 1996 CFB Gagetown trials of the Mowag Generation III 8X8 APC addressed the infantry's fears of wheeled mobility. The cross country mobility differential between the Armour Corps' Leopard C1 and the Infantry's Armoured Personnel Carrier (APC) has now been closed. The Mowag Generation III APC which is the prototype for the General Motors Diesel Division (GMDD) Gen III 8X8 APC incorporates most of the latest wheeled technology mobility enhancers: full electronic power train; central tyre inflation and hydraulic suspension. The addition of chains should give the vehicle a 1.5 metre snow "wading" capability. In all other categories: firepower; protection; surveillance, and situational awareness this APC is on a par if not superior to currently fielded NATO Infantry Combat Vehicles. The government is in the process of honouring their statements to the Land Force.

Attention now moves to other members of the Canadian AFV fleet - Cougar replacement and the retention of the Leopard C1. The Cougar, originally purchased as a training aid to ensure the survivability and transference of armour skills, is in the embarrassing position of conducting operations without adequate firepower, protection, mobility, and the list goes on. Likewise the Leopard C1 with the 105mm gun is in an awkward position. Purchased in the early 1970's, allegedly by direction from the Chancellor of Germany to a reticent Prime Minister of Canada, and contrary to the Requirements Staff studies of that era which advocated a 120mm gunned tank, the Leopard C1 is not adequately battle worthy to join any multilateral security operation requiring Main Battle Tanks. The White Paper is mute on the future of the Leopard C1.

With a clear statement to replace Cougar, silence on the future of Leopard C1 and with an acknowledgement of Canada's resolve to honour collective security commitments the army staff appear to have a major challenge before them. This appears to be all the more challenging to solve in light of the current revolution in "Military Affairs" caused by information age technologies. What is the close combat, direct fire solution for the Land Forces post 2000?



A quick search of public and private geopolitical databases reveal that many are monitoring approximately 100 flash points – areas of instability that could escalate to armed assistance requiring international involvement. Since the end of the Cold War the proliferation of high technology weaponry once reserved for NATO or Warsaw Pact countries is now available in most arms bazaars at bargain basement prices. One of the world's favourite weapon systems is the Main Battle Tank (MBT). Outside of NATO and Ex-Warsaw Pact nations, over forty nations own more MBTs than Canada. The probability of deploying on any multilateral security operation and meeting a belligerent with MBTs is rapidly approaching certainty. Canada appears to have denied both isolationism and replacement of the Leopard C1. How should the army proceed?

The direction given by the Chief of Land Staff (LGen Baril) is both visionary and technically challenging – replace Cougar with an Armoured Combat Vehicle (ACV) in the mid to long term (circa 2005) and improve the Leopard C1 with “scrapped” Thermal Imaging (TI) sights now, then retire Leopard C1 circa 2010. In this manner the close combat, direct fire role rests on Leopard C1 and Cougar initially then is assumed by the Armour Combat Vehicle (ACV). This strategy is a product of current technological limitations that require two vehicles – Cougar and Leopard to execute Warfighting and Operations Other Than War, with the understanding that technology and doctrine will permit fulfillment of all direct fire roles, across the entire spectrum of

conflict, early in the next century on a single chassis – the ACV.

This is a significant paradigm shift with the Canadian army oddly in the forefront of many nay sayers in the wings. Canada appears to be discarding the tank and entrusting the role of the “Queen” of battle to a lighter vehicle. Initially, even the Land Requirements staff felt that the challenge could not be met. The holy grail of MBT performance on a small chassis has alluded all in the 20th century. The industrial offerings of 120mm smoothbores lashed to wheeled chassis, originally designed for less demanding roles, have only served to reinforce the widely held view that real war fighting needs armour on tracked chassis. But, is this still valid? Could industry not do better?

The “Industrial Age” approach to AFVs – more mass, more horsepower is coming to an end. Reliance on sloped glacial plates and thick turret armour is definitely at a close. The current and emerging generations of Anti-Tank weapons attack in all directions. Omni-direction attack requires omni-protection. Omni-protection armour incurs an exorbitant weight penalty that cannot be attained. Future AFVs will have to employ “Information Age” firepower and survivability strategies. Knowing what is transpiring – information is becoming as important as armour plate. A cursory examination of firepower and survivability technology available now confirm that the elusive goal is within our grasp.

Firepower to destroy a MBT at direct fire ranges (up to 5 kilometres)

whether tube or rail launched is advertised in most military magazines and does not require any amplification. Firepower is the least of the challenges. Nanotechnologies – extreme miniaturization herald unprecedented lethality and accuracy. 125mm performance from 105mm tubes mounted on light chassis (20 tonnes) is available!

The most challenging and interesting change on the AFV horizon is survivability. Survivability can be defined as the capacity to avoid or withstand battlefield effects and to continue the mission. Survivability is the product of the sum of the AFV's characteristics – situational awareness, signature reduction, fightability, etc., as well as the traditional firepower, protection, mobility traits. The priority in the survivability equation should be the crew, followed by mission critical systems. Mission critical systems are derived from operational roles and the “battlefield day” which is derived from geopolitical analysis and operational research. The Requirements Staff will express this in the Armoured Combat Vehicle Statement of Requirement (ACV SOR). Survivability is becoming more dependent on signature reduction, hit avoidance and situational awareness than armour plate. Recently published AFV survivability studies provide the developer with the essential direction that ensures current MBT survivability in small chassis.

Who will take the initiative and lead the armour community? Canada does not have a tradition of AFV development and production but the nation does have a vibrant information technology sector.




Canada's heretofore reluctance to procure current generation MBTs has removed one of the principle obstacles to innovation – previous investment. Our goal is in sight and technologically achievable.

The last remaining barriers are money and will. Few if any of today's developers have the resources to provide an "off-the-shelf" solution. And most successful information technology companies take pride in avoiding significant capitalization. The government will have to re-visit its non-developmental approach to acquisition and make exceptions when operational requirements cannot be met in any other way. ACV is such a case.

An ACV that is mission successful from 2005 to 2020 would be built with survivability of the crew as first priority. Like the Merkava a quickly changeable power train located in the frontal section of the chassis would provide passive protection. The crew would be further back, cocooned in their multi-function protection pods. Passive and active armours would protect all from the most demanding attacks (under 120mm). A multi axled drive train provides mobility after mine strikes. An external gun increases hit avoidance while decreasing weight. Firepower is an important subset of survivability because the surveillance and fire control solution can detect and engage in less than

four seconds. As well as incorporating most signature reduction technologies the outer "skin" of the vehicle sports the latest active "chameleon" camouflage. The ACV also benefits from the new digital combat radio and information system (TCCCS-Iris) situational awareness architecture.

Inscribed on each vehicle registration plate is the name of the manufacturer and the design theme, "Designed to withstand battlefield effects and to achieve the mission. Repaired promptly." 





Digitization – A Perspective from Fort Knox

by Major R. Dill



Major R. Dill, 8CH (PL), is presently the Canadian Forces Liaison Officer (Armour) at the US Army Armor Center, Fort Knox, Kentucky, USA.

“Overall, with digitization, the task force found that, provided personnel were adequately trained, there was an increase in lethality and improved survivability and operational tempo.”

INTRODUCTION

The current US Army definition of digitization is “the leveraging of information technologies to acquire, exchange and employ timely digital information throughout the battlespace, tailored to the needs of each commander, shooter and supporter, allowing each to maintain a clear and accurate vision of his battlespace necessary to support planning and execution”.

As one can imagine, digitization is a broad topic that effects all arms. In this article, I will focus on digitization as it applies to the US Army Armor Force. To accomplish this, I will outline the effect the M1A2 Abrams tank had on digitization,

describe the M1A2’s digital system and conclude with a summary of major digitization experiments conducted to date by the Fort Knox US Army Armor Center’s Battle Lab.

M1A2 Abrams

The idea of digitization in the US Army started with the introduction into service of the M1A2 Abrams tank (Figure 1). The M1A2 represented a major technological advance over its predecessors, the M1 and M1A1,



Fig. 1 M1A2 Abrams Main Battle Tank.

because of its electronics and micro processor control (vetronics). In fact, the M1A2 tank was the first US Army weapon system capable of executing both internal (tank functions) and external (command and control) functions digitally.

Contrary to many people’s belief, the M1A2 has not been in operational service very long. The first prototype M1A2 was delivered to the US Army in 1992. Initial Operational Tests and Experiments (Troop Tests) were completed in December 1993 and deliveries of the production model to the Armor School at Fort Knox and other training organizations started in 1994. The first operational units to receive the M1A2, from the 1st Cavalry Division at Fort Hood, Texas, began conversion training on the M1A2 in 1996.

Inter-Vehicular Information System (IVIS)

To understand why the M1A2 had such an impact on digitization, it is necessary to review how it communicates digitally. The term adopted for the digital hardware and software in the M1A2 is the Inter-Vehicular Information System or IVIS. IVIS performs three inter-related digital functions. Two are internal to the tank and one is external. The two internal functions are tank operations and tank diagnostics. Tank operations include power management and the operation of controls and lights.

Tank diagnostics includes a continuous self testing system and fault isolation tests. The external or inter-vehicular digital functions are automatic position updates and the rapid transmission, receipt and display of digital (non voice) messages.

The M1A2 IVIS interfaces with the crew through the controls and displays in the driver's, gunner's and commander's stations (Figures 2,3 and 4). It provides information to the crew on the tank's heading, its position as an 8 figure grid, a grid square map of the area in which the tank is operating and text and graphics messages. Electronic sensors

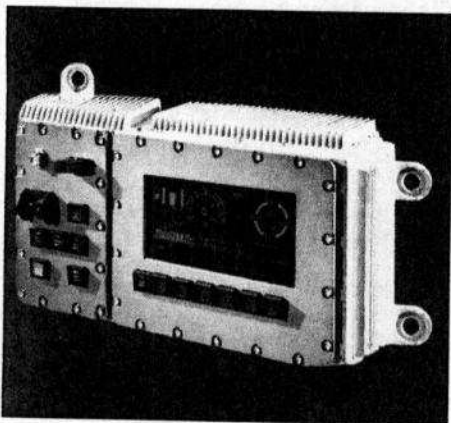


Fig. 2 M1A2 Driver's Intergrated Display.

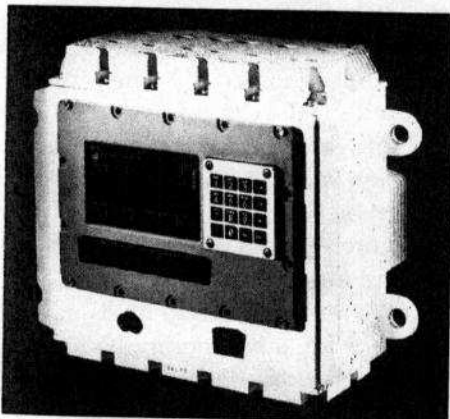


Fig. 3 M1A2 Gunner's Control and Display Panel.

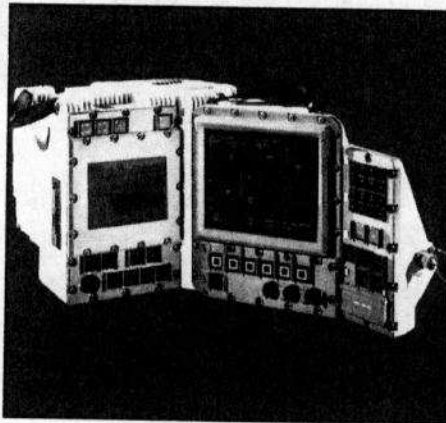


Fig. 4 M1A2 Commander's Integrated Display (CID).

on the M1A2 assist in driving, target identification and information flow between the tanks.

IVIS periodically exchanges information automatically with other tanks to establish and maintain communications. It uses a connectivity table, user information, SINCGARS radio data and routing matrices to deliver messages. To do this properly, each tank's IVIS system must be set up by crew commanders every time they log on to the system. Information such as who you are (eg 1st Platoon Commander, A Company) and what radio net you will be using (eg Radio A), must be entered into the IVIS log on menus displayed on the Commander's Integrated Display (CID) (Figure 4).

The IVIS software supports the following operational messages, listed in order of priority:

1. Forward Observer Command (air)
2. Ground Medevac Request Report
3. Air Medevac Request Report
4. Contact Report

5. Call For Fire Report
6. Spot Report
7. Air Spot Report
8. Message to Observer Report (air)
9. Situation Report
10. Situation Report (helicopter)
11. Enemy Overlay
12. Fire Support Overlay
13. Obstacle Overlay
14. Operations Overlay
15. Enemy Overlay Update
16. Fire Support Overlay Update
17. Obstacle Overlay Update
18. Operations Overlay Update

Sample messages are shown at Figure 5 and 6.

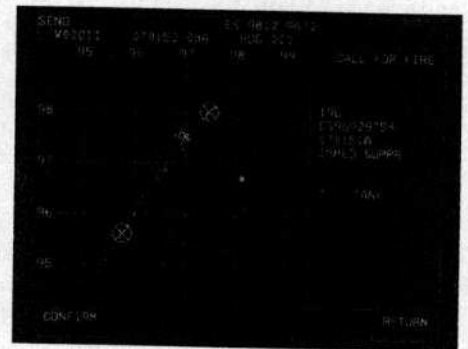


Fig. 5 An IVIS Call for Fire Message.



Fig. 6 An IVIS Spot Report.



A message created on the CID for transmission to other tanks is sent via the tank's 1553 data bus, the Radio Interface Unit (modem) through the SINCGARS radio as a digitized message. This message is received by another tank's SINCGARS and sent to the CID. The message type is displayed in the upper right hand corner of the CID (Figure 7). If more than one message is waiting to be read, the message with the highest priority is displayed. To read the message, the crew commander brings the message onto his display panel. IVIS uses the system clock to time stamp each message created and automatically enters time data into all the reports and returns.

Messages can be sent by IVIS to single or multiple addresses. IVIS uses predetermined routing matrices to identify recipients for each type of message. Directed messages are addressed to addressees individually and require acknowledgment from the Radio Interface Unit in each receiving tank. If an addressee cannot be reached, the sender is notified. Broadcast messages are not addressed to a specific addressee and are received by all on the IVIS net. Broadcast messages are not acknowledged by receiving tanks.

IVIS is connected to the tank's Position Navigation (POS/NAV) system which provides the tank's position and heading on the CID (Figure 8) and the driver's display. Every fifteen minutes or 100 meters of tank movement (but not sooner than every 120 seconds), IVIS regenerates a position report

INCOMING MESSAGE

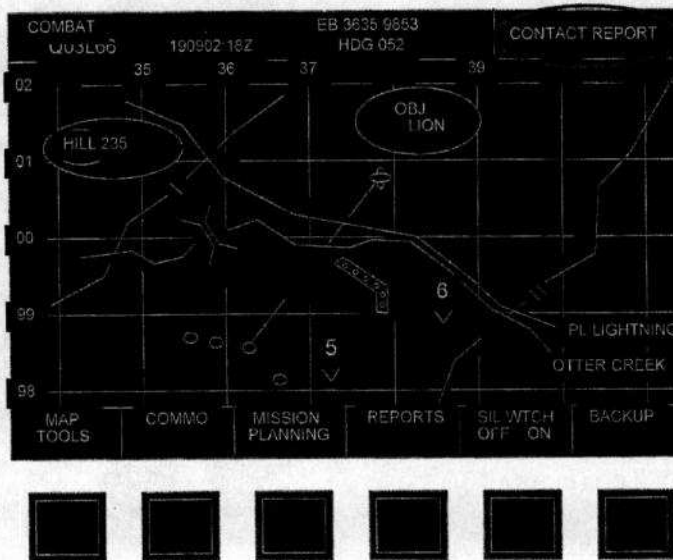


Fig. 7

OWN LOCATION

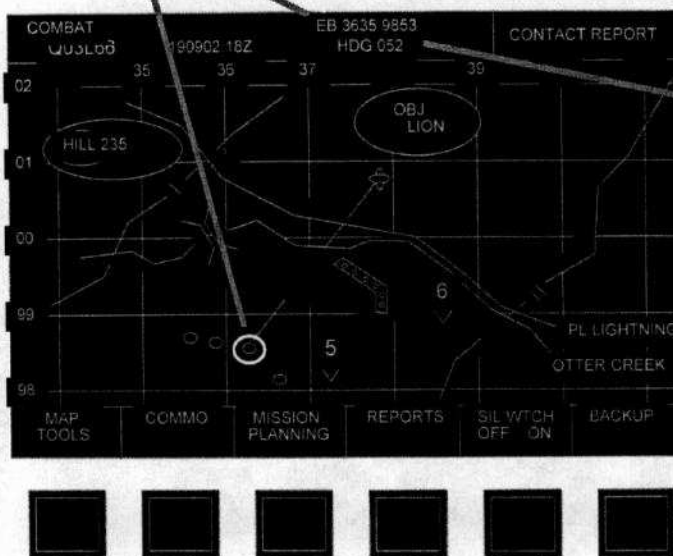


Fig. 8 IVIS Commander's Integrated Display (CID) showing own location and heading.



based on data from the POS/NAV unit. This position report is automatically transmitted to other tanks operating on that specific IVIS net. All friendly tank locations are then updated on every CID as icons (Figure 9).

IVIS is also connected to the laser rangefinder, so an enemy tank position and direction can be determined and accurately recorded on the CID by lasing to the enemy tank. This enemy location can be sent as a digital Contact or Spot Report to all other tanks on that IVIS net and appears on all CIDs as an enemy icon (Figure 10). IVIS also monitors the amount of main gun ammunition fired.

Mounted Maneuver Battlespace Lab

The Fort Knox Mounted Maneuver Battlespace Laboratory (MMBL) was established in 1992 as a means to streamline the identification of

concepts and requirements for the US Army's Mounted Force of the 21st Century. As one of the original six Training and Doctrine Command Battle Labs, the MMBL uses modeling,

simulation and field trials with soldiers and equipment to focus research to seek a quick turn-around on investment and to minimize the risk in procuring an item. Studies are initiated through various programs including Advanced Warfighting Experiments (AWEs), which are experiments that focus on a major increase to warfighting capability across multiple branches. AWEs usually feature a live exercise as a culminating event.

IVIS software and hardware was designed in the late 1980s before a standard definition for tactical internet routing or electronic protocols for the US Army existed. The protocols of IVIS are unique and, initially, an M1A2 could only communicate digitally with another M1A2 and no one else. To solve this vertical only or "stovepipe" communications problem, a series of experiments were designed and conducted by the MMBL.

ENEMY LOCATION

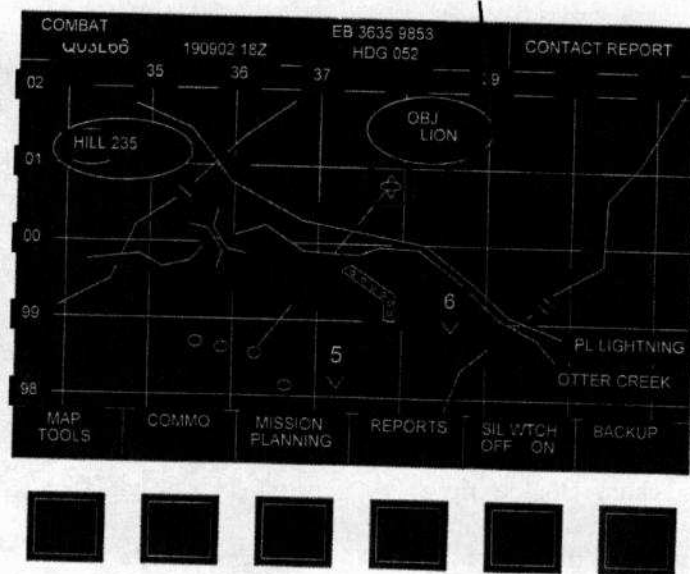


Fig. 10

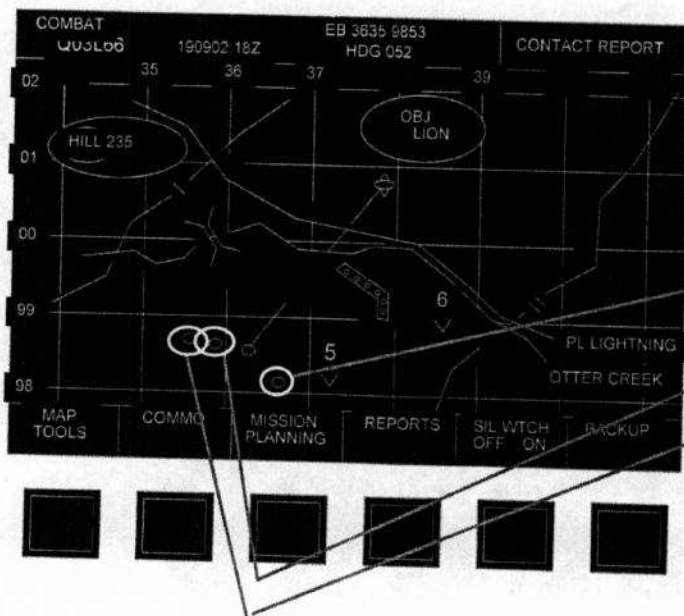


Fig. 9



To allow other members of a unit to communicate digitally with an M1A2, IVIS ground stations (IGSs) were built from modified IVIS hardware, software, protocols, and routing systems and mounted in other vehicles including tactical operations centers (command posts), HMMWVs, M113s, Bradleys and M1A1 tanks. IGSs were built as an interim measure only to permit experimentation with command and control until more robust Appliqué/Tactical Internet systems are fielded after the turn of the century. The current decision is that IGS will not be procured for units equipped with M1A2s, but rather, the M1A2 hardware/software will continue to be upgraded until it becomes fully compatible with the next generation communications system.

In March 1993, the MMBL successfully demonstrated horizontal integration of digital communications when an M1A2 tank communicated digitally with an OH 58 helicopter and a Bradley FIST V. A fire mission was called and successfully executed solely by digital communications. No voice transmissions were used.

This demonstration was followed by a series of simulation and live field experiments involving combined arms equipment. Figure 11 shows the experiments conducted to date and those planned for the future for Force XXI.

Awe Desert Hammer VI

One such live experiment, called AWE Desert Hammer VI, occurred in March 1994 at the National Training Center at Fort Irwin, California. Task Force 1-70 from Fort Knox used M1A2s with its IVIS while other key task force

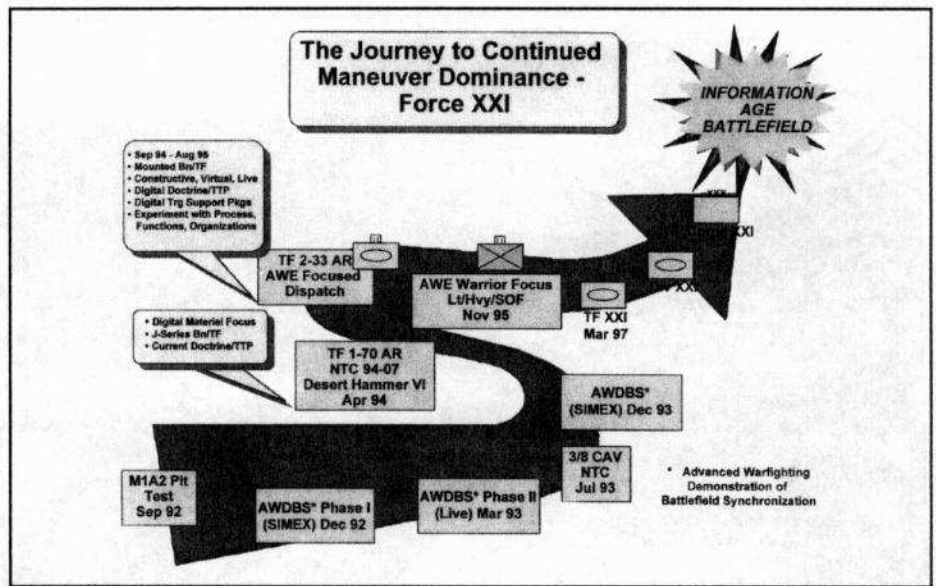


Fig. 11 Past, Present and Future of Force XXI.

vehicles used IGS. In all, 21 command and control nodes were successfully digitally linked. An M1A2 IVIS communicated with an OH 58 helicopter 29 kms away and a M1A2-to-M109A6 Paladin link initiated a successful fire mission.

Desert Hammer VI revealed that by using IVIS and other digital communications, the workload was reduced for both crews and staff. Planning was completed twice as fast as without digital links and less air time was needed for the transmission of messages. Units took less time to maneuver and there was improved situational awareness. Distribution of fire was improved and accuracy of the location of friendly and enemy positions was improved (Figure 12). Overall, with digitization, the task force found that, provided personnel were adequately trained, there was an increase in lethality and improved survivability and operational tempo.

AWE Focused Dispatch

The Fort Knox MMBL was again the lead agency for AWE Focused Dispatch, the follow-on digitization experiment to Desert Hammer VI. Focused Dispatch was a mounted, digitized battalion/task force experiment that examined the following hypothesis: "If procedural, functional and organizational changes in fire support, intelligence, logistics and battle command are implemented as a result of digital connectivity, then enhancements in lethality, survivability and tempo will result."

The goal of Focused Dispatch was to refine digital tactics, techniques and procedures for hand-off to the Experimental Force in the follow-on Task Force XXI AWE. It focused on the process of how to best to employ digital technology.

Focused Dispatch was conducted in five phases over a 12 month period from September 1994 to August 1995. The first three phases were conducted using JANUS. The fourth phase

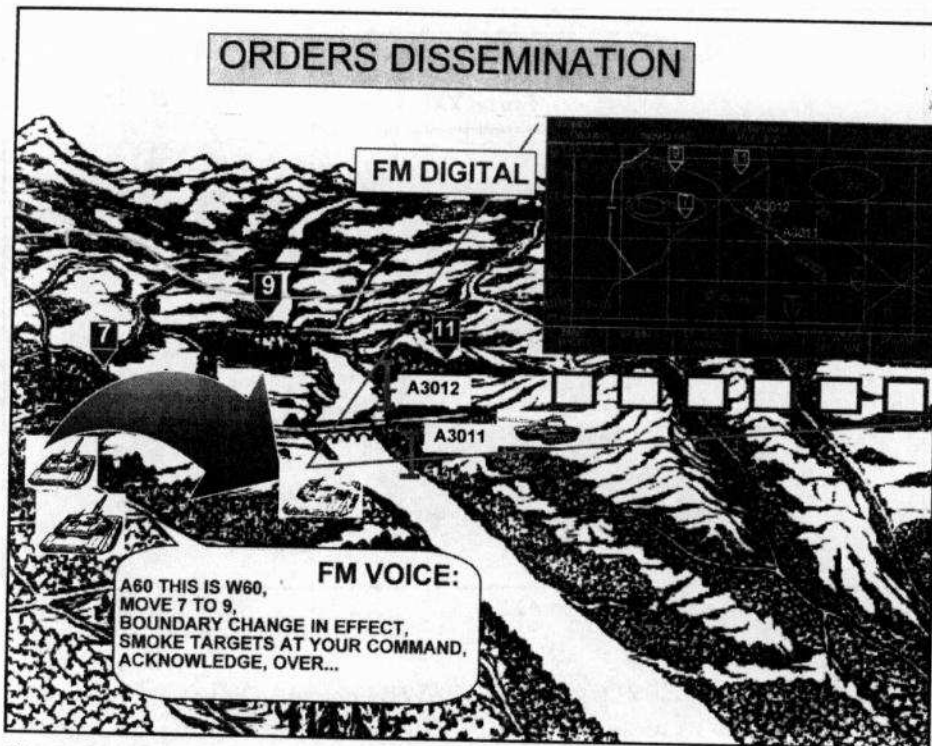


Fig. 12 Digitization will translate to increased lethality and improved survivability.

accomplish simultaneous re-supply and reallocation of supplies already en route. Another observation was that digital communications cannot totally replace voice communications. Due to the human element, the closer to an objective a crew got, the more they tended to rely on voice communications rather than digital communications. Also, the capability provided by digitized communications did not indicate a need to alter the size of battalion/task force or the Task Force staff. In the case of the battalion Signals officer, however, it was found that his role and responsibilities would have to be reviewed based on his increased workload during the experiment.

Focus Dispatch proved its hypothesis and met its objectives with a sufficient level of detail to lay the groundwork for Task Force XXI to conduct the next digitization experiment to be conducted by 1st Brigade, 4th Infantry Division (Mech) from Fort Hood, Texas, in March 1997. For this experiment, a new digital command and control system hardware and software called Appliqué will be used.

CONCLUSION

"Digitization is seen by the US Army as a means of improving the lethality, survivability and operational tempo of their forces." The US Army Armor Center, Fort Knox, has been, and will continue to be, at the forefront of efforts to explore how best to use digital technology. Digitization started with the M1A2 Abrams tank. The M1A2 and its IVIS will remain an important element in the combined arms digitized battlefield.

involved the simulators in the Mounted Warfighting Simulation Training Center (SIMNET) and the fifth phase linked live forces to virtual forces. Live forces consisted of one M1A2 tank company team, a tank battalion HQ staff, brigade command and control elements, combat support and combat service support elements maneuvering in the Western Kentucky Training Area, located 100 miles west of Fort Knox in Greenville, Kentucky. The virtual forces consisted of the remaining three company/teams and an air defence platoon leader located in the SIMNET facilities at Fort Knox. Also linked was a Bradley (Enhanced) air defence platoon at the simulation center at Fort Bliss, Texas and an attack helicopter battalion located at the Aviation Simulation Center at Fort Rucker, Alabama.

Vehicles used in the live portion of the final phase of Focused Dispatch included M1A2s, the experimental M4 Command & Control Vehicle, experimental M1A1 and M2A2 Bradley Battle Command Vehicles, scout HMMWVs, fire support vehicles, M113s and an HMMWV ambulance. All players successfully transferred digital information. IVIS communicated with the following other arms digital systems: the artillery's Initial Fire Support Automated System, the M121 Enhanced Mortar Fire Control System, the logistics SACIMS system and the Brigade and Below Command and Control software system.

Some notable observations from this experiment were that digital communications facilitated an unprecedented level of resource management including the ability to



The Employment of AFVs in Support of Civilian Police Operations

by Master Corporal J.G. Pringle



At the time of this submission, MCpl Pringle was employed as an instructor at the LFAA, MTSC. He has since been posted back to The Royal Canadian Dragoons where he is presently a crew commander.

"No doubt a cumbersome chain of command will have to be streamlined considerably to facilitate a vehicle's employment in a timely manner."

In June 1996, the Militia Training Support Centre (MTSC) was tasked to provide two BISON wheeled APCs with crews to support Royal Canadian Mounted Police (RCMP) training at MTSC Aldershot. It quickly became apparent that this tasking was a little out of the ordinary and showed the potential of being more than a "one off" event. This paper will examine the background for civilian law enforcement requests for AFVs and offer some suggestions to facilitate their use.

Since the turn of the decade, the Canadian Forces have provided

AFV support to civilian police agencies on several occasions. The current and future additions to the AVGP family readily fulfil a civilian law enforcement requirement. Currently RCMP officers operate a mixed fleet of police cruisers, 4 X 4 "suburban" style trucks and converted bomb disposal trucks. When civilian law enforcement officers enter their domestic version of "high intensity conflict", they should be able to do so from within armour protection. Any reader who has spent time in Europe will no doubt remember some of the vehicles available for Internal Security (IS) and riot operations.

The reader must not envision armed AFVs manned by RCMP, provincial and local police members. I must point out this requirement is during a Gustafsen Lake,

Akwesasne/St Regis, or Oka type operation. Day to day operations are handled adequately by the aforementioned mixed fleet. What should be examined is establishment of parameters for requirement. The basic question is: When would police agencies ask for AFV support? Hopefully, *before* one of their soft skinned sport utility vehicles (SUV) is riddled with AK-47 fire as what happened at Gustafsen Lake. First time lucky, next time things may be less fortunate.

No doubt a cumbersome chain of command will have to be streamlined considerably to facilitate a vehicle's employment in a timely manner. Ideally, a request for AFV support should be promptly and competently actioned no later than 12 hours from requirement identification to delivery on site. At best, the basic and even not so basic officer will only have a bare bones familiarization on AFVs. This necessitates a high degree of inter-agency cooperation. Pre-determined SOPs would address the question of actual operation, ie. who drives, commands, what vehicle types to provide, rules of engagement, who does maintenance? Using as a model the standard RCMP Emergency Response Team (ERT) of 10-12 members with two vehicles deployed, they would lose four team members. Couple this with the requirement for driver

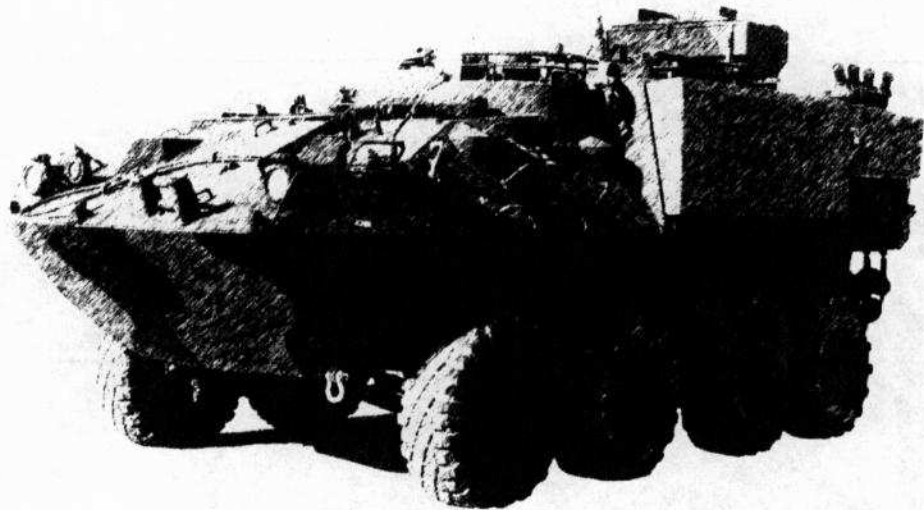


qualification on vehicle type and continuous refresher training and very quickly the vehicle becomes a manpower drain. To alleviate this drain and ensure a safe level of operation is maintained, CF members should be tasked to operate the designated vehicles.

Whether the civilian police agencies or the CF make the first tentative steps at direct liaison is moot. What is necessary is a flexible, coherent chain of command, sound SOPs and adequate notice of intent to fulfil the end users aims. In short, one has inter-agency combined operations.

The BISON wheeled armour personnel carrier is highly suitable for law enforcement tasks. Adequately armoured (and armable) it is capable of transporting one ERT per vehicle and has very good performance both on and off road. This would be the principal vehicle requested. As delivered, the BISON is well suited for basic day to day "yeoman" service. Should the occasion arise when a specific operation call for vehicle modification, these could be locally fabricated at minimum time and expense.

Some law enforcement vehicle improvements that readily come to mind are: (1) an armoured shield for the crew commander that retains the C6 machine gun mounting capability; (2) installation of the smoke grenade dischargers and stocking said grenades within the CF supply system; and (3) a vehicle front mounted ram capable of delivering the vehicles weight/mass against such things as car barricades, hasty road blocks, etc. Secondary uses are forced entries against



armoured doors found at, such places as "crack houses" and motorcycle gang club houses. Lastly, a bullet stop to nullify the inherent "shot trap" produced by the distinctive AVGP hull shape. With these simple, low cost additions there would not exist any need to purchase a "purpose built" vehicle. Some dedicated Internal Security (IS) vehicles available off-shore are the HOTSPUR POLISEC APC or TRANSAIF multi-role armoured vehicles both of the UK. Germany, a country with considerable experience in these areas, produces the UR-416M and TH444 APC. What should be avoided at all costs is the temptation to "kit build" or "armour up" a truck and use it in lieu of an AFV. Although cheap to do and operate, it would at best still be a heavy truck offering a false sense of security with limited abilities. Some considerations by the law enforcement "higher ups" is overcoming a certain reluctance to deploy AFVs. The rank and file

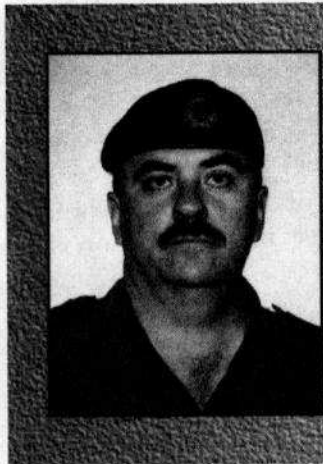
ERT members I've spoken to readily see the value of AFVs and had numerous suggestions on when and how to employ them. The fear of AFVs escalating a situation is unfounded. By the time the vehicle is sought, the police will already *have* a situation. Timely arrival of armoured vehicles could prevent situations from getting worse and expanding beyond or into an armed stand off.

This article has examined when, where and why the AFV would be requested and used. It has also put forth options for surrogate vehicles that could possibly be used in lieu of a true AFV.



Cougar Crew Gunnery Trainer

by Warrant Officer A. Royer



Warrant Officer A. Royer, 12th RBC, is presently the Instructor Gunnery Team WO serving at the Royal Canadian Armoured Corps School, CFB Gagetown.

With the Corps moving quickly into the 21st century, the way we utilize simulators for gunnery training must be reviewed. Enter the COUGAR CREW GUNNERY TRAINER (CCGT)! The CCGT will be introduced to the Corps during the fall of 97. Unlike its predecessor the CVIGS, CCGT will use computer generated imagery to create the scenery, targets and weapons effects. This new trainer will allow crews to be trained iaw 305(13) armour

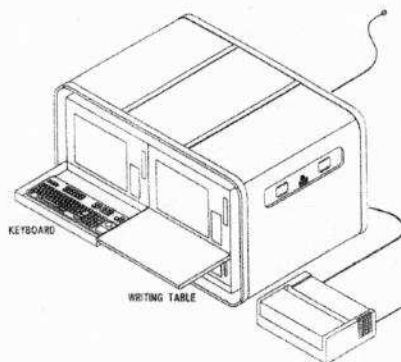
gunnery training, in all aspects of gunnery.

CCGT will allow the instructor to follow, debrief and coach crews inside the confines of the classroom or armoury. For experienced crews, they will have the option to engage targets that will fire back and either punch smoke and/or jockey. One large improvement on our present trainer is the possibility of engaging targets with coax. Never has the

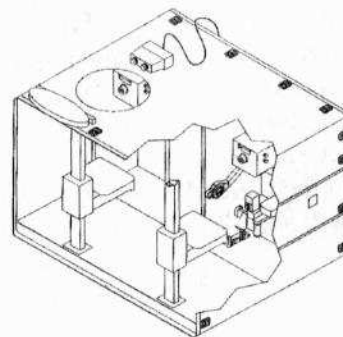
Corps been capable of conducting this with our existing simulator, the IMR. With this in mind, the CCGT may very well replace the IMR in the future. The way we integrate the system into our training may be the deciding factor.

The instructor will be capable of monitoring the crew from his INSTRUCTOR CASE ASSEMBLY (ICA) giving him all the necessary tools to properly debrief the crew. He will be able to follow each fall of shot, observe the crew's reaction and assess time and accuracy standards (T&A). He will also have the option to replay the shoot in order to show the crew what they did right or wrong.

The system will look similar to the drawings that are included in this article, though there may be changes as part of the final design review. Without question CCGT will enhance our gunnery skills and bring the Corps into the 21st century.



INSTRUCTOR CASE ASSEMBLY

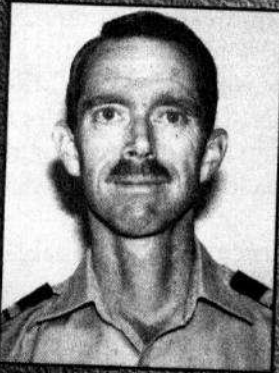


COUGAR CREW COMPARTMENT



Leopard Thermal Sight – Initial Project Briefing

by Major A. Bolster



Major A. Bolster, 8CH (PL), is a Deputy Project Director with the Directorate of Land Requirements.

When the Leopard C1 was purchased in 1978, the tank came equipped with a state-of-the art fire control system including an integrated laser range finder and an analogue ballistic computer supported by a number of sensors. Shortly after acquisition, the Leopard C1 was upgraded with the PZB 200 Low Light Level Television System and the IRS 100 Thermal Pointer. In 1985, the German Army commenced a retrofit program to incorporate a new fire control system, the EMES 18, which included a gunner's primary stabilized sight with thermal imager, laser range finder and fire control computer with a digital ballistic core. The EMES 18 is in-service in Denmark, Germany, Italy and Norway. Greece also has the EMES 18 but without the thermal sight. This deficiency will shortly be corrected.

On 6 November 1996, the Honourable Douglas Young, Minister of National Defence announced at CFB Gagetown the approval for Leopard Thermal Sight. The project will purchase 139 surplus German Leopard 1A5 tanks, equipped with a cast turret (like the original Leopard 1A2 loan tanks) with the EMES 18 FCS already integrated. The number 139 represents the requirement for 114 gun tanks, 5 training turrets and 20 additional tanks for spare parts and test equipment. At this time, it is not certain whether we will refurbish and install the cast turret on our chassis or remove the FCS and machine our welded turrets to accept the new system. There are a number of reasons why the preferred option is to use our existing turret but cost of machining may prevent this option being selected.

A project to install a thermal sight in the Leopard C1 has existed since at least 1984. There are a number of reasons as to why it has taken 12 years to get to the stage at which we find ourselves. Having said that, the project implementation is at an early stage and only a minimum of detail on schedule, training, support, etc is available. In fact, the contract has not yet been signed for the project.

The project staff from the armour side consists of LCol B.J. Forsyth, Project Director, myself as the deputy and Capt E.S. Paquette with responsibilities for training. My aim is to personally brief all units at least once each year and provide updated articles for each issue of the Armour Bulletin. It will be important to establish channels of communication as the small staff will require assistance from the Corps, especially the RCAC School, to bring the tank into service in an effective manner. Our goal is to provide a minimum amount of disruption to units and to have all training devices and lesson plans ready when the first tanks arrive at the Armour School.



Defence Ethics Principles

The following DND Ethics guidelines were distributed at the conference sponsored by the Defence Ethics Program, entitled "The Many Faces Of Defence" held in Ottawa 24-25 October 1996.

Ethics Statement of Defence

As members of the Canadian Forces, liable to the ultimate sacrifice, and as employees of the Department of National Defence having special obligations to Canada, we are dedicated to our duty and committed to:

**RESPECT THE DIGNITY OF ALL PERSONS
SERVE CANADA BEFORE SELF
OBEY AND SUPPORT LAWFUL AUTHORITY**

Guided by these fundamental principles, we act in accordance with the following ethical obligations:

LOYALTY. We dedicate ourselves to Canada. We are loyal to our superiors and faithful to our subordinates and colleagues;

HONESTY. We honour the trust placed upon us. We value truth and candour, and act with integrity at all times;

COURAGE. We face challenges, whether physical or moral, with determination and strength of character;

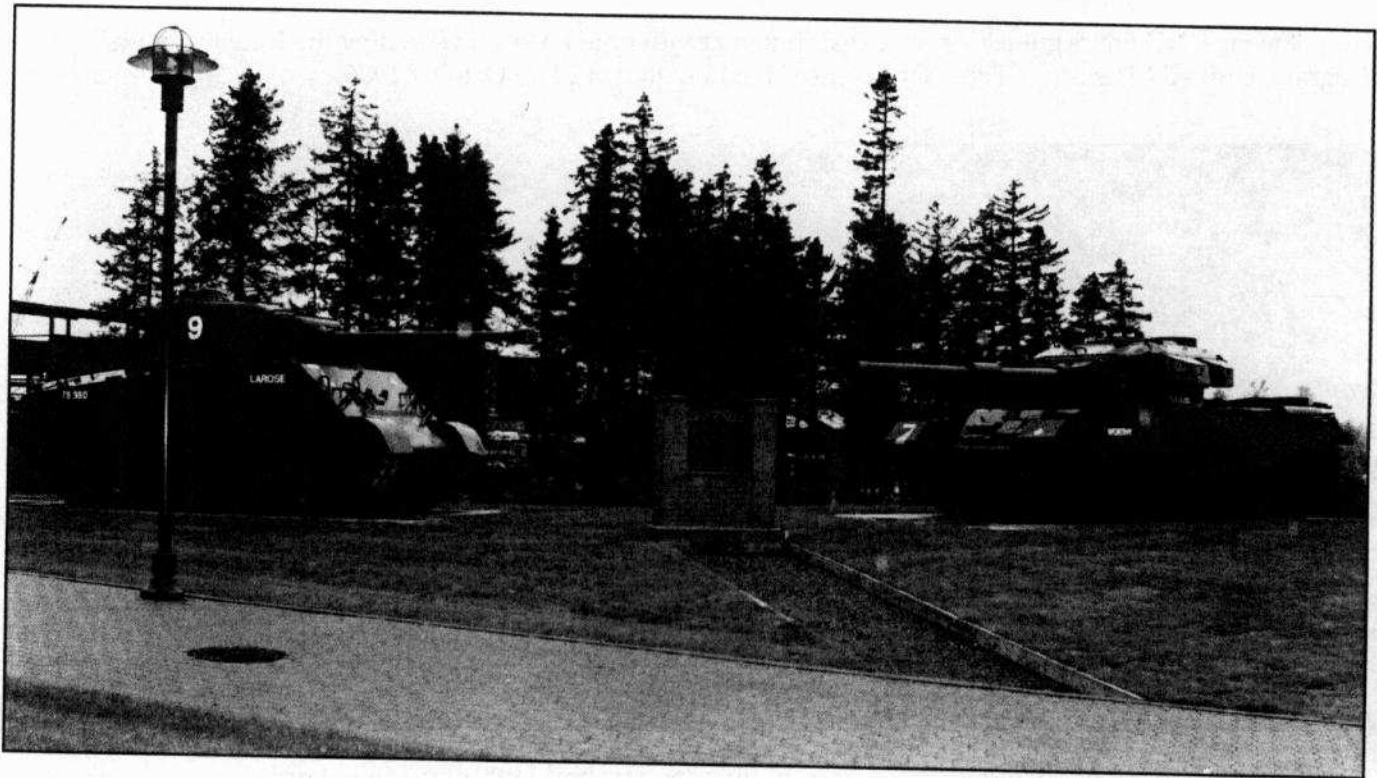
DILIGENCE. We undertake all tasks with dedication and perseverance. We recognize our duty to perform with competence and to strive for excellence;

FAIRNESS. We are equitable in our dealings with others. We are just in our decisions and actions;

RESPONSIBILITY. We accept our responsibilities and the consequences of our actions.



Corps Adjutant's Comments



When I first joined the Corps I couldn't spell Adjutant, but I sure knew where his office was, and now "I are one."

The Editor will now be providing me space in the Bulletin to keep all Blackhatters informed of pertinent Corps issues applicable to this forum. I look forward to any feedback which you may be able to provide.

First off, it is necessary that I clear the net with just what it is that the Corps Adjutant does. The title "Adjutant" is a bit of a misnomer. Unlike at a unit, I do not get involved in personnel matters. All that business belongs to the respective command-

ing officers, regimental sergeants-major and the career managers. Nor do I have an official link to the Association. De facto, I am more like an "executive assistant" to the Colonel-Commandant, Director and the Deputy Director. I manage their Corps TD funds and coordinate their visits to the units. My financial responsibilities also include the Corps NPF which, small as it is, covers a number of critical items. Additionally, I am tasked "as the need arises", including acting as Secretary to the latest Association AGM and Board, or wherever my personal skills can be employed, such as "eloquently" introducing the awards at the

Corps mess dinner. Finally, I am responsible for maintaining and distributing the Corps Appointment List.

I ask for unit assistance to keep me apprised of their requests for the Colonel-Commandant and the Director to visit, significant dates or events (preferably with some lead-time to allow for planning and budgeting), pass on any changes of their key personnel, and ensure their Corps contribution is made. Informally, I strive to keep open the lines of communication and participate in cooperative issues within this diverse organization, so I can be a source information



for all of you and can be reached as follows:

Phone: CSN 432-2000, ext 1633
 Civ (506) 422-2000, ext 1633
 FAX: CSN 432-1448
 Civ (506) 422-1448
 Internet:rcacsc@gagetown@brunswickmicro.nb.ca

I should also point out that due to my location at the School, the Director's Ottawa EA for Corps matters is Major Bill Soros at CSN 849-0323 or Civ (613) 945-0323.

With respect to ethics and digitization, here is my two cents worth. We have heard so much of career and financial orientation as well as human rights. This can be appreciated given

the complicated society we live in today. What happened, however, to being mission oriented? This appears to be lost as one scales up the chain of command. Also, let us not be blinded by the novelty of technology without considering its implications. Case in point: Coyote. Have we purchased a reconnaissance vehicle or, on the other hand, a surveillance vehicle? Can the Regular Force continue an informal career stream and recee training system at the units as they did with the Lynx? Can the Reserve Force adequately train on the vehicle given their financial, personnel, time and structural constraints? The Corps has the wherewithal to deal with all these issues. Let's get on with the program.

Enough lecturing (see what happens when one has been at the School so long?) and now on to a completely different matter. As the accompanying photos attest, the Gagetown tank monuments have finally been moved from the former School location. They now command a dominant and impressive position next to School Headquarters. This was accomplished after a great deal of staffing by the Chief Instructor, lobbying by the RSM, and the assistance of Hussars, Sappers and civilians.

Major D.M. Poitras
Adjutant RCAC





The Corps Regimental Sergeant Major



I would first like to express my pleasure on being appointed the Corps RSM. I consider the appointment an honour and a privilege and intend to serve the Corps to the utmost of my ability.

One of my first duties as Corps RSM was to attend the Royal Canadian Armoured Corps Association Conference hosted by the RCD in Petawawa. Until 1995, NCMs of the Corps had no direct involvement with the Association; it was primarily a compulsory association of Corps officers. However, in an effort to expand NCM influence over Corps matters, a proposal was accepted in 1995 to invite Corps NCMs to join the Association as ordinary members. Although we continue to be represented at the Association by the Commanding Officers of our units, all Corps NCMs now have the opportunity to belong as ordinary or life members.

As the Corps RSM, I was appointed a member of the Association's Executive Council. It is the executive council that forwards Corps areas of concern to the Council of Defence Association who in turn lobby the Government on our behalf. The NCMs are clearly the backbone of the Regiments and the Corps; however, there are issues that we cannot solve alone and must turn to the national and political levels to find answers. As a member of the Association and your involvement with committees and projects you can contribute to this process.

In Petawawa, as the first ever NCM member of the Executive Council, I was definitely made to feel as a part of the team. On a number of points I was asked to comment on the NCMs' point of view. Furthermore, RSMs in attendance with their COs were given the opportunity to join formal syndicate discussions and participate and contribute in less formal gatherings.

The requirement for Corps NCM involvement with the RCAC Association is genuine and timely. I strongly encourage all to consider the Association, seek out more information and evaluate your ability to join and contribute. Expanded NCM involvement with the Association promotes a brighter future for an organization that has given and will continue to give much to the Corps.

Chief Warrant Officer J.G. Brown
Regimental Sergeant Major RCAC



Letters to the Editor

Questions and comments regarding, previously published articles or content of the bulletin are encouraged and welcome, selected portions of which may be included in this newly dedicated section of each edition.

Gentlemen,

Congratulations on your last edition of the Armour Bulletin dealing with Ethics and Leadership; the articles were first class and very interesting. I am, however, curious as to the identity and significance of the men whose photos appeared on your cover.

Shirley Kendall-R.
Trois-Rivières, Que

In simple terms, we goofed; the photos were of the Corps' eight Victoria Cross recipients. The cover of the last edition is reproduced below with the names and units of the individuals concerned. Furthermore, as a result of your comments and to prevent a recurrence of this oversight, we have changed our format to allow space for a cover description on the inside page.

Thank you. – ed



From left to right, Top: Sgt E.J.G. Holland, RCD, November 7, 1900 / Lt G.M. Flowerdew, LdSH (RC), March 30, 1918 (Posthumous) / Capt H. Strachan, FGH, November 20, 1917 / Lt F.M.W. Harvey, LdSH (RC), March 27, 1917.

Bottom: Sgt A.H.L. Lindsay, LdSH (RC), July 5, 1900 / Maj D.V. Currie, SALH, August 18, 1944 / Lt H.Z.C. Cockburn, RCD, November 7, 1900 / Lt R.E. Turner, RCD, November 7, 1900.



On Ethics and Leadership... (Vol. 29, No. 1, 1996)

A wise man told me recently that the problem with the military is that most people don't understand that "military service" does not mean "self service". If we are to serve our country with the pride and distinction of our forefathers we must ensure that our leadership, at all levels, is competent and confident and that our ethical values are at least on par if not slightly higher than our civilian brothers and sisters. They should, in fact, be beyond reproach. However, it is true that all of us at one time or another in thought, word, or deed have broken ethical standards. If there is someone out there who hasn't, I would say they missed one of the courses open during their estimate! I don't profess to have the complete answer to our present situation, but I believe that there is a problem with the Canadian leader and soldier. If we can find a way to re-think our method of leadership training and emphasize the importance of ethical behaviour, we will go a long way to salvaging our credibility with the Canadian public and with our own personnel.

Having said all that, I would submit that there was something lacking in this edition of the Armour Bulletin. The realm of ethical behaviour and leadership ability are not the exclusive domain of those officers sitting in the most senior positions within the Corps. It is a given that all of the officers who submitted articles to this Bulletin have served their country with distinction however, most are from the same generation. I believe that to present a more complete representation of the feelings about ethics and leadership within the Forces we must collect opinions from a cross section of the Corps. Perhaps we could have included articles from a Major, a Captain, a Chief Warrant Officer and a Warrant Officer etc. In addition to two or three from our senior officers. This might have given a broader perspective to the whole issue and generated quite a bit more discussion from several levels.

Capt M.W. Bech
8CH (PL)

Congratulations on a most professional effort.

The Corps protesteth too much, methinks. Some of the philosophes who are preaching may be the very ones responsible. We are all quite aware what the issues are.

I think the Corps would profit more from example rather than lectures on idealism.

As for the new proposed grace, it is too symbolic of our present military malaise; words, words, and more words. Personally, I prefer the toast of the Royal Canadian Hussars - which, inscribed below in its entirety, is a more appropriate model of cavalry eloquence and intent:

"Gentlemen, Thank God"

LCol R.J. Jarymowycz, CD
Dir MCSC, SQFT

It would be folly for a junior officer to debate the accuracy of the opinions offered by such distinguished officers. Indeed, few people who wear a uniform could successfully argue against some of the concepts put forth on the subject. I am concerned, however, about the perception that the root of the military's problems stem from weakened ethical standards and leadership practices at the junior level; that we, the young leaders, must re-visit our origins and immerse ourselves in our basic leadership teachings. Admittedly, this would not hurt the development of the Officer Corps, however it is too easy a solution for a more far-reaching problem. In the end, I believe it is the systemic and governmental influences on our senior leadership combined with a lack of direction that has failed us, not our ethics.

A wholehearted return to bygone ethical standards in the belief that it is the solution to prevent "bad apples" from emerging will not change this sad state of affairs. Ethics are a reflection of society; as one changes so does the other. In that past standards risk being out of place or unrealistic in the present, ethics must be adaptable to change while at the same time remaining rooted in their original foundations. The leaders of today possess the same abilities and use the same tools to make ethical decisions as our predecessors. Our ethical leadership is sound; it is our collective mission which has remained clouded for years.

Capt A.J. Zdunich
12^cRBC



Personally, I do not believe that there is a general paradigm of deteriorating leadership in the RCAC or the CF. However, I also do not believe that we are a utopian organization without deficiency. Secondly, I believe that to be concerned over something which can potentially affect my future is human nature. To express concern over something I have no power to affect, or insufficient knowledge to understand is a waste of energy. With that said, I am more concerned with how I can improve the leadership abilities of my subordinates and myself than I am with blaming or changing the "system".

Although most articles in this edition of the *Armour Bulletin* present suggestions which would surely foster better leadership in the system as a whole, it is the articles of BGen S.V. Radley-Walters and MGen C.J. Addy which concentrate on individual behaviour. It is these articles which I believe to be extremely valuable for the junior leader.

As BGen Radley-Walters and MGen Addy did, I believe we must concentrate on personal behaviour and characteristics to secure our future. Blaming the system for our deficiencies is perhaps a good subject for discussion, but it offers few suggestions on how we can improve. Focussing on individual characteristics and enforcing quality ethical demeanour is the key to ensuring good future leadership.

Capt P.J. Peyton
LdSH (RC)

An idea which caught my attention was that of Brigadier-General Jeffries which he expressed in the letter which accompanied his submission. He stated that "the CF has yet to update its ethos and effectively standardize the lenses of leadership." This is most certainly true; however, I do not believe that this problem can be rectified within our organization. Any focusing of our "lenses" must be based on clear guidance from the Canadian people through their representatives in government.

While, I believe that there is a certain requirement for a re-examination of ethics in the CF, the onus is on the the federal government to lead way. Only when we receive clear indication of purpose, direction and appropriate support, monetary and moral, can we begin the arduous task of focusing our "lenses" and garnering a sense of "ethical worth" which has been lost through decades of neglect.

Capt S.C. DeCaluwe
12RBC

It was with a great deal of interest that I read the latest edition of the *Armour Bulletin*, especially the departure from the 'norm' to have the entire issue devoted to ethics. (Did we really need an **entire** issue devoted to it?)

It appears to me that the over-riding message was summed up by our esteemed Colonel-Commandant with his bullet points at the front of the magazine. Where, however, do we find a clear definition of ethics? Are not ethics those moral attributes with which we are imbued by our families and honed by our peers? Should the discussion of ethics be pointed at our soldiers and junior officers or should the discussion be addressed to those who are in middle and senior leadership positions?

Although it is also outside my purview to meddle with the padres and their duties, I feel obliged to comment on the suggested Official Grace of the RCAC.

Throughout our history we have welcomed into our ranks Canadians of differing ethnic and religious backgrounds. The Canadian Forces have always recognized this and have ensured that everyone has had access to spiritual counsel and support regardless of their religious affiliation and, more important, the religious affiliation of the padre. CAMT 2-36, Staff Duties in The Field, (it appears as though I have dated myself) indicated prayers and rites for those members of any religion. These serving members were included. The suggested Official Grace excludes all who are not Christian.

LCol J. Burns (Retd)



Having participated with the 12^e RBC Battle Group in fall 1993, I agree that being on an operation is a unique experience. But for a young lieutenant, gaining the loyalty and the respect of his soldiers is not an easy task. I think that the relationship with the NCOs is one of the most important point to establish as soon as the "newborn" enters in the picture. The troop looks first to the Troop Warrant for the example and then to the officer. This is due to the short nature of the troop leader's appointment. This is true in operations and in garrison.

I had another very rewarding experience when I served as an exchange officer with the 2^e Régiment de Hussards (France). To find oneself quite suddenly in command of foreign army troops certainly puts a lot of strain on one's ability to adapt. But here again, the important thing is to focus on getting to know the men in order to earn their respect, loyalty and trust. Only then can one begin to improve one's technical skills and exercise one's powers of command.

I do not think that the importance of the troops can be over-emphasized. They are the cornerstones of our Corps. There is a simple truth we must never forget: a chief with no troops is no leader.

Capt L.P. Binette
12^eRBC

In his article, Colonel Snell asked the question, "...at what point is it acceptable to provide some less than 'pure and uncompromised' military advice?" My response is, indisputably, that it is never acceptable. Military leaders, and I emphasize leaders, should never 'compromise' or alter in any way, what they believe to be a feasible military plan of action. They should never tailor their advice, to the point where it becomes militarily unsound, in order to suit a pre-determined political decision. To do so is unprofessional and unethical. Further, and more importantly, it endangers both the success of the mission at hand and the lives of the troops.

Capt K. Berube
QM RCAC School

I have received the Bulletin and read your "foreword", and I want to congratulate you for having accepted to take on the mantle of Editor, a heavy burden in the best of times.

My wife joins with me in wishing you resounding success in these difficult times for the Canadian Forces. There is no doubt in our minds that your superiors have made the right choice.

Be assured that I shall always be looking forward to receiving the next issue of the "Armour Bulletin" and to reading its content. The Bulletin makes me and every member of the Armour Corps proud to have served and to serve.

LCol R. Gauthier, CD (Retd)
12^eRBC

My congratulations on an excellent publication and its discussion of Ethics and Leadership. I was pleased to read the writings of such distinguished "Black Hats" as Generals Rad, Addy, Milner, etc. I believe that you have done the Army a great service by raising the issue of integrity in this forum and hopefully encouraging a dialogue amongst serving Officers, WOs, NCOs and Troopers. (There are no NCMs in my dictionary). It is only through open dialogue that we can face the issues that confront the Army and begin the process of "shifting attitudes" back towards ethical leadership.

I am encouraged that "truth - duty - honour" are not hollow slogans of the spin doctors and that the profession of arms is still considered an honourable calling.

I recall with affection and pride my service with Gen Clive Addy in Toronto and Gen Clive Milner in Calgary. I passed a copy of Col Nick's paper, "Where have all the Tigers Gone?", to my current Prof at the Faculty of Education at Brock University. She was suitably impressed - as she should have been!

Keep it up, Tigers!

Maj P. Tweedie (retd)
PPCLI and The Cdn AB Regt

First of all, a job well done with your last Armour Bulletin. As a fellow "Tanker" it is always great to read about other armor soldiers, especially since the U.S. Army is facing the same hard problems that now face the Canadian Army. The articles in this last edition were dead on target: we must never forget what it is we stand for as professional soldiers. Leadership, ethics and values for us are more than just words; they are a way of life. Keep up the great work.

SGM C.C. Hayhurst
U.S. Army

