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AN URBAN OPERATIONS TRAINING CAPABILITY FOR THE CANADIAN ARMY

By/par Major G.J. Burton

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Abstract

Military operations in urban terrain are becoming the norm rather than the exception. The Canadian Army needs to invest in an effective urban operations training capability. This research paper sets out to justify that need and propose a way ahead to achieving such a capability. Urban operations are defined and described, and examples of urban operations undertaken by Canadian land forces are used to underscore the relevance and importance of such operations. A training capability deficiency is identified. A report is given on current Army efforts to reorient towards urban operations. Policy and doctrine are examined, and examples of local initiatives are used to highlight the need for a centrally standardized and funded training capability. Key requirements for such a training capability are deduced from various lessons learned and include urban operations standards, knowledge, training system and realism. A path down which the Army can proceed is investigated. Examples of current and emerging technologies are illustrated as potentially suitable for delivering effective urban operations training. In order for the Army to achieve its desired end state of establishing an effective urban operations training capability, a capital project is proposed.

1. Introduction

> "They are… the post-modern equivalent of jungles and mountains – citadels of the dispossessed and irreconcilable. A military unprepared for urban operations across a broad spectrum is unprepared for tomorrow."
>
> Ralph Peters

The world is a dangerous place. Pick up any newspaper or tune in to any television news program and you will be greeted with stories of crime, contagion, natural disaster, terrorism and war. Each of these stories is similar for their human victims and the actions of security services. Less obvious is another common thread that links most stories. They almost all take place in or near villages, towns and cities. Indeed, the damage to or destruction of property is often a significant part the story. The urban background of these stories seems innocuous to the audience, but it poses significant challenges to the security services that must operate in it.

In Canada, security services include the police, firefighters, emergency medical services and the military. These services exist to protect citizens from threats to life, property and country. Their prevention work or even their mere presence helps deter incidents from occurring. We rarely hear those stories. Domestically, we hear the stories of investigations, arrests, crowd control, quarantine, rescues, firefighting, disaster relief and damage control. Internationally, we hear the stories of war, genocide, suicide bombers, peacekeeping, humanitarian assistance, training assistance and nation building. When needed, citizens have an expectation that security services are equipped and trained to respond immediately.

The old adage that 'practice makes perfect' is indicative of the common understanding of the role that practice or training plays in preparing to master any activity. Implied in this statement is that practice requires the same conditions as the perfected act. These conditions could include using the actual tools, instruments or equipment required for the perfected act. They could also include the same environment or stress under which the perfected act is conducted.

Militaries use the adage 'train as you fight' or 'train as you operate.' In these statements, fighting and operating are the perfected acts, for which training under the same conditions is demanded. Clearly it is impossible for militaries to train exactly the way they would fight as that would ultimately entail shooting real ammunition at each other. It would therefore be better to interpret the adage as 'train as closely as possible to the way you will fight.' Implied from this interpretation is the need to simulate the engagement aspects of fighting. The teachings of nineteenth century military philosopher Carl von Clausewitz agree with this interpretation. He summarized the requirement for armies to train as follows:

> Peacetime manoeuvres… can give an army an advantage over others whose training is confined to routine, mechanical drill. To plan manoeuvres so that some of the elements of friction are involved, which will train officer's judgment, common sense, and resolution is far more worthwhile than inexperienced people might think. It is immensely important that no soldier, whatever his rank, should wait for war to expose him to those aspects of active service that amaze and confuse him when he first comes across them. If he has met them even once before, they will begin to be familiar to him. This is true even of physical effort. Exertions must be practiced, and the mind must be made even more familiar with them than the body.[1]

[1] Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1984), 122.

Urban operations are routine for police, firefighters and emergency medical services personnel. It is obvious then that they must be equipped and trained accordingly. As urbanization increases in complexity, the requirement for specialized urban operations equipment and training also increases. In Canada for example, Emergency Preparedness Canada has developed a Heavy Urban Search and Rescue or HUSAR capability which is being implemented in Toronto, Calgary and Vancouver.[2] The HUSAR capability requires a coordinated response from all security and civil services to conduct search and rescue operations in urban areas that have been struck by disaster. The agencies involved in HUSAR possess the equipment to respond and are trained in skills such as confined space operations, hazardous material operations, emergency building shoring, trench and evacuation rescue, logistics functions and operations and incident management.[3]

Armies on the other hand have focused on operating in non-urban or open terrain where decisive force-on-force battles can fought. Indeed, the tendency has been to avoid fighting or operating in cities. As far back as the fourth century B.C., the Chinese military philosopher Sun Tsu advised, "The worst policy is to attack cities. Attack cities only when there is no alternative."[4] A result of this doctrine is that modern armies have focused on training for operations conducted in open terrain. Additionally, equipment has been optimized for open terrain operations. The Canadian Army is no exception. Its doctrine, equipment and training are all optimized for open terrain operations.

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[2] Toronto Emergency Medical Services, "Heavy Urban Search and Rescue (HUSAR)." Toronto EMS web site; available from http://www.city.toronto.on.ca/ems/operations/husar.htm; Internet; accessed 3 March 2005.

[3] Ibid.

[4] Sun Tzu, *The Art of War,* trans. Samuel B. Griffith. (New York, Oxford University Press, 1971), 78.

Despite the historical reluctance to fight in cities, armies through the ages have nevertheless had to conduct operations in them. As the world becomes ever more urbanized, so does conflict. Today, armies cannot avoid operating in cities whether it is for war, peacekeeping or humanitarian operations. The logical deduction is that armies must evolve to focus on urban terrain operations. From a Canadian perspective, this deduction is strongly supported by the work of Major Robert McIlroy. In a 2004 research paper for the Canadian Forces College, he put forward a strong case that the Canadian Army required an increased emphasis on urban operations. He argued that the world was becoming increasingly urbanized and that Canadian and allied military operations were increasingly likely to take place in such areas. Major McIlroy concluded that the entire Canadian Army effort needed to be focused on developing appropriate doctrine, training and skills for urban operations.[5]

In any organization, training represents a significant investment. In the case of their Army, Canadian citizens desire security provided by properly trained military personnel. The citizens provide the financial investment, and in return expect the best value for their money. The Army, charged with the responsibility of providing effectively trained land forces for Canada's security, has a stake in the investment as spender of the citizen's money to provide the most effective training capability. Soldiers, whose lives literally depend on effective training, are ultimately the ones who carry the proceeds of the training investment forward with them on security missions. The effectiveness, and therefore the best value of the training capability, can only truly be evaluated by the

[5] Major R.D. McIlroy, "A Requirement for Increased Emphasis in Urban Operations within the Canadian Army," *Canadian Forces College Review* (2004): 143-179.

results of the mission. Obviously, the security goals of the mission must be successful. Most importantly however, the highest measure of success must surely be that the soldiers return home safe, healthy and able to conduct further missions. Considering that soldiers' lives are at stake, there is a tremendous onus on the Army to invest wisely in its training capability. Because military operations in urban terrain are becoming the norm rather than the exception, the Canadian Army needs to invest in an effective urban operations training capability.

This research paper will set out to justify the need for an urban operations training capability for the Army. It will first articulate the training capability deficiency by providing background to the importance of urban operations. Urban operations will be defined and recent examples of Canadian Army urban operations will be used to illustrate the need for a training capability. This will be followed by a report on where the Army is today. The report will examine developing urban operations training doctrine. It will also highlight a number of low-level initiatives to create urban training capability. Once the capability deficiency is defined, the paper will develop requirements for where the Army must be. Lessons learned from operations and allies, as well as medical and scientific studies will be used to deduce requirements. Additional requirements will be extracted from a review of allied urban training capabilities. Finally, the paper will provide a glimpse of how the Army can develop an urban training capability. Current and emerging technologies will be illustrated and the notion of an Army-level capital project to procure an urban operations training system will be proposed.

2. Background to the Urban Training Capability Deficiency

As already mentioned, security services find themselves operating in urban environments every day. In Canada, civilian security services have well established doctrine or procedures, as well as training and equipment for the urban environment. The Canadian Army does not.

In 2000, the Directorate of Army Doctrine was tasked to establish an Urban Operations Working Group to conduct a combat function audit of urban operations capabilities. The Working Group was tasked to conduct an inventory of urban operations initiatives within the Army. It was also tasked to examine the urban environment, develop new operational concepts and identify new capabilities needed to succeed in the urban environment, determine existing capability deficiencies, and develop a road map to move the Army forward. The road map was to include concept and doctrine development, training needs, changes to organizations, and identification of equipment needs and high payoff R and D thrusts. The Urban Operations Working Group met for two years and tabled its findings and recommendations in a final report on 29 May 2002.[6]

This research paper is focused specifically on the Canadian Army's urban operations training capability deficiency and the need to overcome it, and is subsequent and complimentary to work completed by the Urban Operations Working Group. In order to understand the deficiency, some background to the importance and relevance of urban operations will be provided. Examples of urban operations undertaken by Canadian land

[6] The author was a member of the Urban Operations Working Group and is intimately familiar with its work and reports.

forces will underscore the relevance and importance of urban operations. Then relevant findings of the Urban Operations Working Group will be used to illustrate the training capability deficiency. A summary of deductions will confirm the deficiency and set the stage for addressing it.

Before launching into a discussion about the importance of urban operations, it would be useful and appropriate to define some key terms. The examination of terminology will start with terrain since it is the underlying theme of the entire paper. Terrain is simply defined as "a stretch of land with regard to its physical features."[7] Simple or open terrain is "plain, spread out and accessible."[8]

The opposite is complex terrain, a term used in military parlance, but for which no official military definition can be found. In its final report, the Urban Operations Working Group offered an unapproved definition of complex terrain as, "those terrain features that impact on line of sight, restrict manoeuvre and separate the solider from the vehicle. In general terms, urban, jungle, mountain and forest are considered to be complex terrain."[9] There is one articulated definition that comes from a glossary of meteorology which states that complex terrain is "a region having irregular topography, such as mountains or coastlines. Complex terrain can also include variations in land use, such as urban, rural, irrigated and un-irrigated. Complex terrain often creates… unique

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[7] Catherine Soanes, Ed., *The Pocket Oxford English Dictionary, Ninth Edition* (Oxford: Oxford University Press, 2002), 943.

[8] *Ibid*., 845, 626.

[9] Department of National Defence, *Report By The Urban Operations Working Group Into Providing An Urban Capability For The Army In The Future Security Environment* (Kingston: Director of Army Doctrine 4, 29 May 2002), 1.

local weather characteristics…"[10] Because it can include unique weather characteristics, one can quickly deduce that complex terrain could also encompass jungles, arctic or polar regions and deserts. From these definitions alone it is easy to comprehend why armies have tended to focus on operating in open terrain, where decisive force-on-force engagements can be fought.

Urban terrain is arguably the most complex of complex terrain types. According to Ralph Peters, "the initial mental image is of physical forms – skyscrapers or huts, airports and harbors, size, construction density, streets, sewers, and so on."[11] However, he postulates that "while the physical characteristics of the… city are of great importance, the key variable is the population."[12] In referring to the populations of cities, towns and villages, Peters uses the terms human terrain, human architecture, flesh-and-blood terrain and human high-ground.[13] Peters' inclusion of the human nature of urban terrain is vital for military thinking about cities, but it is missing one more critical piece of the urban puzzle. Modern humans thrive on information and have developed an extensive electromagnetic environment for passing it to one another. Urban terrain can therefore be summarized as having physical, human and electromagnetic dimensions.

The complexity of urban terrain is confirmed by research conducted by the North Atlantic Treaty Organization (NATO) Research and Technology Organization (RTO). Following its 1999 report on Land Operations in the Year 2020 which found that NATO

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[10] American Meteorological Society, *Glossary of Meteorology*. Database on-line; available from http://amsglossary.allenpress.com/glossary/search?id=complex-terrain1; Internet; accessed 6 March 2005.

[11] Ralph Peters, "The Human Terrain of Urban Operations," *Parameters* (Spring 2000): 4.

[12] *Ibid*., 4.

[13] *Ibid*., 4.

forces would have to conduct operations in urban areas, the NATO RTO studied the matter and prepared a 2002 report on Urban Operations in the Year 2020.[14] The report notes that "the complexity of the current urban environment is best defined as the cumulative effect of a series of interconnected layers of society and infrastructure."[15] It further identifies that "today's urban environment represents the centres of industry, commerce and social activities and, because of the size and the presence of different groups within it, is the probable area where tensions and perhaps conflicts are most likely to arise in the future."[16]

Having defined terrain, it is now time to examine the term operation. The Oxford Dictionary defines operation as both "the action of operating" and "an organized action involving a number of people."[17] These are broad definitions that could be applied to any individual or group. From the military perspective, operation has been further defined as "a military action or the carrying out of a strategic, tactical, service, training or administrative military mission; the process of carrying on combat, including movement, supply, attack, defence, and manoeuvres needed to gain the objectives of any battle or campaign."[18]

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[14] North Atlantic Treaty Organization Research and Technology Organization, *Report By The RTO Study Group Into Urban Operations In The Year 2020 For The NATO Research And Technology Organisation* (North Atlantic Treaty Organization, 24 May 2002), I.

[15] *Ibid*., 3.

[16] *Ibid*., 3.

[17] Catherine Soanes, Ed., *The Pocket Oxford English Dictionary*..., 626.

[18] North Atlantic Treaty Organization, "NATO Glossary of Terms and Definitions : Allied Administrative Publication – 6 2005." NATO On-Line Library; available from http://www.nato.int/docu/stanag/aap006/aap6.htm; Internet; accessed 10 April 2005.

Operations in urban terrain, or urban operations, have been defined by both the Canadian Army and by NATO. The Canadian Army Terminology Board defines an urban operation as an "operation that is conducted within a battlespace that is comprised primarily of built-up areas."[19] Clearly the battlespace in this definition does not consider the human dimension of urban terrain. It is also uncertain if this battlespace was intended to include the electromagnetic dimension. The NATO RTO developed a definition of urban operations for its study that is far more comprehensive. Urban operations are "those military and other activities in an area of operations where significant defining characteristics are man made physical structures, associated urban infrastructures and non-combatant populations."[20]

It is noteworthy that the Western military definitions related to urban operations have only been developed during the last five or six years. In large part, this is due to the decline of peer-competitors with whom battle would have been fought in open terrain. Insurgency on the other hand appears to have increased, particularly in cities. The terrorist attack on the World Trade Center on 11 September 2001 is the most obvious turning point in this regard. Sean Edwards offers an American perspective on the reason why cities are an insurgent's battle ground of choice:

> Insurgent forces generally seek to avoid warfare on open ground where the airpower and other sophisticated weapon systems of the United States can be brought to bear. Urban operations are one way to do this. The urban environment

[19] Public Works and Government Services Canada, "Officially Approved Definition of 'Urban Operations'." Termium Plus, the Government of Canada's Terminology and Linguistic Database on-line; available from http://www.termium.comtpv2Show/termumplus.html?lang=e2; Internet; accessed 6 March 2005. The term urban operations, its abbreviation UO and the definition were officially approved by the Army Terminology Board on 23 January 2001.

[20] North Atlantic Treaty Organization Research and Technology Organization, *Report By*…, 2.

> offers not just physical cover and concealment but also political cover behind non-combatants. By seeking to inflict as many casualties as possible, the weaker state can follow an asymmetric strategy that concentrates on subduing the will to fight of the American people rather than defeating American military forces. The classic guerilla strategy – to win by not losing – can create the impression that U.S. forces are fighting in a quagmire, which diminishes the prospects for success in the eyes of the public.[21]

Urban terrain dramatically limits the capabilities of modern armies whose sensors, weapons, vehicles and communications equipment were designed to operate in the relatively open terrain of the Cold War battlefield of Western Europe. Buildings are three-dimensional, occupying sub-surface, surface and above-surface space. Defenders have the advantage of cover and concealment, their positions being further strengthened by the screening effects that buildings have on radio signals, lasers and electro-optic sensors. The height and depth of buildings significantly reduce the effects of ground and air launched weapons aimed at those targets that can be identified in urban areas. Rubble and other debris can be a formidable obstacle to most modern military vehicles. Subterranean passages aid defenders in moving freely without detection. Communication infrastructure may allow defenders to communicate without detection, especially if it is left intact for psychological or information operations. Most significantly, the existence of a non-combatant civilian population dramatically increases the chance that innocents may become casualties. Some civilians may also aid and abet defenders while maintaining the façade of innocence. With little or no hope of attaining technological superiority over western armies, it is no wonder that insurgent forces use urban terrain to their advantage.

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[21] Sean J. A. Edwards, "Cross-Case Analysis," Chapter 3 in *Mars Unmasked : The Changing Face of Urban Operations*. (Santa Monica, California: Rand, 2000), 47.

Urbanization is not a surprising or strange phenomenon to most Canadians who have seen profound and continuing expansion in most cities and towns across the country. Elsewhere in the world, unprecedented urban growth continues to dramatically reshape global population configurations, particularly in developing countries. At present, more than half of the total world population is urban and the trend towards further urbanization is irreversible.[22] Given the propensity of insurgent forces to use urban terrain, as well as the irreversible growth of urbanization, it is reasonable to postulate that Canadian land forces will find themselves operating in urban terrain more often than in the past. Rob Engen summarizes a Canadian perspective on the emergence and growing importance of urban operations as follows:

> It is becoming increasingly deceptive to view urban warfare as a scenario, another 'special' environment needing to be addressed as a footnote to – or entirely separated from – broader military operations. Canadian tactical doctrine currently approaches fighting in built-up areas in this inadequate manner. Given the proliferation of instances of urban warfare and the compounding value of urban population centres as strategic, economic, and political centres of gravity, one can expect that most future conflicts will involve fighting in the streets as an important operational component. It is not beyond reason to imagine that eventually urban warfare will become synonymous with warfare, a norm rather than an exception.[23]

Engen's view is supported by other intellectuals who agree that urban terrain shall be the battlefield of the future. Colonel Bernd Horn talks about "complexity squared"[24] to describe operating in the future battlespace. In this battlespace, asymmetric conflict will

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[22] Major G. Burton and Major G. Ohlke, *Exploitation of Millimeter Waves for Through-wall Surveillance during Military Operations in Urban Warfare.* Available from http://www.rmc.ca/academic/gradrech/military6_e.html; Internet; accessed 31 October 2004.

[23] Rob Engen, "Military Operations in Urban Terrain – Ramifications for Canadian Defence Policy." Conference of Defence Associations Institute 6th Annual Graduate Student Symposium 24-25 October 2003. Report on-line; available from http://www.cda-cdai.ca/symposia/2003/engen.htm; Internet; accessed 3 March 2005.

[24] Lieutenant-Colonel Bernd Horn, "Complexity Squared: Operating in the Future Battlespace," *Canadian Military Journal* (Autumn 2003): 7.

be commonplace, with the terrain of choice being urban. Lieutenant-Colonel Wayne Eyre states that, "it would be folly not to recognize that the urban sprawl will be the primary battlefield for the foreseeable future."[25] Finally, the principal finding of the Urban Operations Working Group was that, "urban operations will be a major component of future operations regardless of level of intensity and scope of mission. Urban operations are the most difficult complex terrain operations as they consist of complex terrain (the city), the infrastructure and the non-combatants."[26]

While the consensus is that urban operations are becoming the norm rather than the exception, they are not new to the Canadian Army. During the Second World War, the Canadian Army had extensive experience fighting in urban terrain. The victory of the 1st Canadian Division at Battle of Ortona in Italy has long been considered one of the most significant successes of Canadian arms. In addition, much of the fighting in Northwest Europe was in the densely populated areas of Holland, Belgium and Germany.

Operations since then have tended to be less combat-oriented. Peacekeeping and peace support operations have required Canadian soldiers to operate in urban terrain. They monitored villages throughout Cyprus from 1964 until 1974 and then the United Nations buffer zone in Nicosia from 1974 until 1993. They patrolled the streets of villages and towns in Croatia and Bosnia from 1992 until 2004. Twice in ten years, Canadians have deployed to Haiti to operate in the capital city of Port au Prince. Since 2003, Canadian

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[25] Lieutenant Colonel W.D. Eyre, "The Urban Web: An Operational Concept for Offensive Operations in the Urban Sprawl of the 21st Century," *Canadian Army Journal*, Volume 7.1, (Spring 2004): 74.

[26] Department of National Defence, *Report By The Urban Operations Working Group*…, 11.

troops have been part of the NATO-led International Security Assistance Force (ISAF) in Kabul, Afghanistan, where they provide a variety of security assistance to the nation building effort of the United Nations approved mission. Most recently, the Disaster Assistance Response Team deployed to Sri Lanka to provide humanitarian aid to tsunami victims whose critical infrastructure had been destroyed.

It would be inappropriate not to mention domestic operations. In 1997, the Canadian Army, in conjunction with the Navy and Air Force, responded to flooding of the Red River in Manitoba. Their Herculean efforts saved the city of Winnipeg from disaster and assisted countless farmers and villagers reduce property damage. In 1998, troops again responded to a winter ice storm that devastated infrastructure in east central Canada and threatened citizens. Operations were conducted in urban and rural areas of Ontario, Quebec and New Brunswick.

Even though Canadian troops have regularly participated in urban operations over the last sixty years, the Urban Operations Working Group took an inventory of urban operations related activities and found three dramatic capability deficiencies. The first was that "there is no doctrine or tactics above the rifle company."[27] Indeed, the low level doctrine of which the Working Group spoke was based on the experiences of the Canadian Army during the Second World War.

The second deficiency was that, "training is extremely limited and there are no current plans to update training needs or to introduce urban related lessons into either officer or

[27] *Ibid*., 3.

NCM (non-commissioned member) DPs (Developmental Periods)."[28] This deficiency is amplified by Colonel Bernd Horn who states that "fighting in built-up areas is not a traditional core competency of the Army. This is further exacerbated by the inability, due to failure to train and practice, of soldiers and commanders to think in a three dimensional manner."[29] The training need is clearly identified by Rob Engen who states that "individual officers and soldiers will require a thorough understanding of the urban environment as a fundamental part of normal combat skills... conducting military operations in modern cityscapes is tremendously demanding and requires special training."[30] Engen warns that "an ill-prepared force will be massacred in an urban environment. Canada, as an expeditionary power, needs to take careful note."[31]

The last deficiency identified by the Working Group was that, "while the Army has purchased some equipment to increase individual performance the Army lacks formal direction that would make it essential that equipment operate in the urban environment."[32] This deficiency is related to the Army's operational equipment and does not appear to consider that specific equipment might be needed purely for training for urban operations.

The Urban Operations Working Group made a number of findings relevant to the training deficiency. Firstly, "current concepts, doctrine and equipment are designed for an open

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[28] *Ibid*., 3.

[29] Lieutenant-Colonel Bernd Horn and Regan G. Reshke, "Defying Definition: The Future Battlespace," Chapter 8 in *Towards the Brave New World: Canada's Army in the 21st Century*. (Kingston, Ontario: Directorate of Land Strategic Concepts, 2003), 91.

[30] Rob Engen, "Military Operations in Urban Terrain…

[31] *Ibid*.

[32] Department of National Defence, *Report By The Urban Operations Working Group*…, 3.

battlespace where the enemy can be easily detected and engaged with stand-off fire."[33] Secondly, "urban operations require the ability to apply precise scalable effects. While the Army is not optimized for urban operations, the infantry-centric nature of the force structure facilitates Army of Tomorrow [urban operations] initiatives."[34] Thirdly, "training provides the highest pay-off in the near and mid-terms; however, the design and content of all aspects of individual and collective training require a fundamental shift from open terrain to complex terrain."[35] Lastly, "close combat will remain inevitable and the individual soldier remains an essential element of urban operations."[36]

What are the key deductions from all this? Clearly, urban terrain is very complex, consisting of physical, human and electromagnetic dimensions. The physical dimension includes man-made structures and infrastructure that have height and depth on the surface, sub-surface and above surface. These structures affect the performance of the sensors, weapons and equipment of modern military forces. The electromagnetic dimension exists in the infrastructure and may be useful to all parties operating in the urban terrain. The human dimension includes non-combatants who are innocent, but who may also help or hinder urban operations. Additionally, the human dimension includes diversity, politics and economics that must be well understood by those operating in the environment.

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[33] *Ibid*., 11.
[34] *Ibid*., 12.
[35] *Ibid*., 12.
[36] *Ibid*., 12.

Military operations are also complex and when superimposed on the dimensions of urban terrain, will require officers and soldiers to have special knowledge and training. Allies and intellectuals agree that urbanization in the world is irreversible, and in future, modern militaries will almost always find themselves operating against irregular forces in urban terrain. The Canadian Army has participated in numerous urban operations for the last sixty years, but has had virtually no urban operations doctrine, training or equipment. These deficiencies were confirmed by the Urban Operations Working Group and are supported by intellectual assessment. This background conclusively indicates that Canadian land forces will have to operate in complex urban terrain in the future. In order to do so, officers and soldiers must have knowledge of the complexity of urban terrain, as well as the training to operate in it.

Despite the lack of capability articulated so far, the Army has started to make progress in optimizing for complex terrain operations.

3. Today's Developing Army Capability

So far, a very gloomy picture has been painted regarding the Canadian Army's capability to conduct urban operations. And although formal urban operations doctrine, training capability and equipment has been deficient, it has not been completely absent. Somehow, Canadian soldiers have been remarkably resilient in devising ingenious methods to prepare themselves for the urban operations they have faced. Numerous 'one-time-only' local initiatives have been organized by commanders who understand the need, but whose Army has not provided standardized, multi-use resources. This ground

swell of initiative, coupled with a plethora of intellectual study and some high profile operations, has begun a process of transformation within the Army. Indeed, the complexity and seriousness of the threat posed by potential urban operations, both domestic and international, has been acknowledged at the highest levels of Government.

This section will provide a report on where the Army is today in turning the focus away from open terrain operations towards urban operations. The hierarchy of policy and doctrine will be examined, particularly the positive steps taken since 2002 towards optimizing for urban or complex terrain operations. Examples of local initiatives will be used to highlight the extent to which commanders will go to provide their soldiers with the best possible urban training opportunities. The need for a centrally standardized and funded training capability will become clear.

The changes to policy and doctrine find their true genesis and impetus in the aftermath of the terrorist attacks of 11 September 2001 in the United States. These attacks brought home the sudden awareness to citizens of the world that urban terrain was the battlefield of choice for irregular forces. The consequent United States led 'War on Terrorism' attracted most civilized nations, including Canada. Canada lacked policy in this area, particularly domestically.

In April 2004, the Government of Canada released its first ever national security policy document titled, *Securing an Open Society: Canada's National Security Policy*. The document provides an excellent framework from which specific measures can be implemented to enhance Canada's security, both domestically and internationally. The

national security policy states, "The government recognizes that the Canadian Forces constitute an essential national security capability… Our forces must also be able to defend Canada, help secure North America, and address threats to our national security as far away from our borders as possible."[37] Most importantly, "In this increasingly unstable international threat environment, Canada must have armed forces that are flexible, responsive and combat-capable for a wide range of operations, and that are able to work with our allies."[38] This keystone policy statement provides the start of a foundation from which a variety of doctrine, training and equipment can be developed and implemented. Of course, urban operations are included in 'a wide range of operations.'

Flowing from the national security policy is a new document titled, *Canada's International Policy Statement : A Role of Pride and Influence in the World*, which was released on 19 April 2005. Issued in five parts, the Overview document issued by the Department of Foreign Affairs and International Trade unequivocally articulates Government understanding of the importance of urban operations. The following vivid description is provided:

> The image that captures today's operational environment for the Canadian Forces is a 'three-block-war.' Increasingly, there is overlap in the tasks our personnel are asked to carry out at any one time. Our military could be engaged in combat against well-armed militia in one city block, stabilization operations in the next block, and humanitarian relief and reconstruction two blocks over. Transition from one type of task to the other can happen in the blink of an eye.[39]

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[37] Privy Council Office, *Securing an Open Society : Canada's National Security Policy* (Ottawa: Privy Council Office, April 2004), 49.

[38] *Ibid*., 50.

[39] Department of Foreign Affairs and International Trade, *Canada's International Policy Statement : A Role of Pride and Influence in the World Overview* (Ottawa: Department of Foreign Affairs and International Trade, 2005), 11.

The Government further acknowledges that, "today's front lines stretch from the streets of Kabul and the rail lines of Madrid to our own Canadian cities."[40] But most importantly, "the Canadian Forces must embrace new technologies, concepts and doctrines… In turn, the Government, and Canadian citizens, will support them with the tools needed to do the job… Investments today will enable the Canadian Forces to develop the expertise and skills that Canadians, and the world, desperately need."[41]

When the national security policy was released in 2004, Canada was in the middle of a six month period of leading the ISAF in Kabul, Afghanistan. There can be little doubt that the combined experience of Canadian military, diplomatic and humanitarian relief leadership played a major role in focusing the international policy review of a year later. The international policy statement clearly amplifies the keystone national security policy and provides a concrete foundation from which to build urban operations capability.

Government of Canada acknowledgement of the urban operating environment does not stop in the Overview document. The Defence Policy Statement of the International Policy Review, issued by the Department of National Defence, provides specific vision, mission and task statements for the Canadian Forces.

The vision for the Canadian Forces acknowledges that, "Missions are now far more complex and dangerous, with troops frequently deployed to failed and failing states…

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[40] *Ibid*., 12.
[41] *Ibid*., 14.

where… they have been confronted with new dangers from… civil disorder, to clashes with irregular forces in urban areas."[42] It also acknowledges that,

> The challenges involved in rebuilding countries devastated by war or internal strife are enormous and cannot be handled by military forces alone. Instead, they demand the involvement of other government departments and non-governmental organizations… For peace and reconstruction efforts to take root, effective cooperation with local governments is also essential.[43]

The vision is that, "Our military will become more effective, relevant and responsive. The key… is the transformation process on which the Canadian Forces are now embarked."[44] A critical requirement of transformation is to "continue to invest in people."[45] Specifically,

> For transformation to be successful, our military personnel must possess the skills and knowledge to function in complex environments where operations and technologies are changing at breakneck speed. Professional and highly competent people, available when required and in sufficient numbers, are the Forces' most valued resource. To this end, recruitment and retention will remain one of the Forces' top priorities.[46]

Following transformation, the Forces will have the ability to deploy three kinds of joint formations that include a Special Operations Group, a Standing Contingency Task Force and other Mission Specific Task Forces.[47]

The priority mission of the Canadian Forces is the defence of Canada. From a domestic urban operations perspective, the Forces will, "work more closely with civil authorities to prevent serious threats to Canada from materializing, countering these threats if

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[42] Department of National Defence, *Canada's International Policy Statement : A Role of Pride and Influence in the World Defence* (Ottawa: Department of National Defence, 2005), 8.
[43] *Ibid*., 9-10.
[44] *Ibid*., 11.
[45] *Ibid*., 12.
[46] *Ibid*.
[47] *Ibid*., 12-13.

prevention fails, and helping mitigate the consequences of an attack should one occur."[48] To ensure this capability, the Forces will, "dedicate specific resources – people, training and equipment – to enhance their ability to carry out domestic roles."[49] Does the scenario from the introduction sound vaguely familiar?

Defence of North America is the number two priority for the Canadian Forces. From a Land Force perspective, defending North America will be enhanced by: "improving their ability to operate alongside American forces, including through more frequent combined training and exercises; exploring with the United States ways to enhance… military support to civilian authorities; and continuing to participate in international operations overseas to address threats at their source."[50]

Finally, Canadian Forces will contribute to a safer and more secure world. Canada will remain in old alliances such as the United Nations and the North Atlantic Treaty Organization and continue developing an alliance with the European Union. The Canadian Forces will help to further develop the Government's defence, diplomacy and development or '3D' approach to complex conflict and post-conflict situations. Specific roles for the Forces will include restoring stability in failed and failing states, providing military training assistance, providing defence diplomacy and forward presence, and participating in arms control.[51] Land Force oriented missions will include combat

[48] *Ibid*., 17.
[49] *Ibid*.
[50] *Ibid*., 23.
[51] *Ibid*., 24-29.

operations, complex peace support and stabilization operations, traditional peacekeeping and observer operations, humanitarian assistance operations and evacuation operations.[52]

In contributing to international operations, the Land Force will: "provide light forces to support the Special Operations Group; provide the land component of the Standing Contingency Force; provide the land component of two, potentially different Mission-Specific Task Forces and sustain them overseas indefinitely; and provide a brigade headquarters, capable of commanding a multinational formation for one year."[53]

The Government of Canada understands the complexity and importance of urban operations. The National Security Policy, the International Policy Statement Overview and the Defence Policy Statement are replete with acknowledgements to that end. The policy between documents is well linked and the direction to the Canadian Forces contained therein, includes roles, missions and both assigned and implied tasks. There is now a concrete policy base at Government and Department levels from which the Canadian Army is justified in developing doctrine and training capability for urban operations.

The paper will now examine existing doctrine instruments within the Canadian Forces and the Army as they relate to urban operations. It must be stressed that it is not the aim of this paper to write or re-write doctrine for urban operations. Before starting, a definition is in order. Doctrine refers to the "fundamental principles by which the

[52] *Ibid*., 28.
[53] *Ibid*., 31.

military forces guide their actions in support of objectives. It is authoritative but requires judgment in application."[54] Doctrine is hierarchical, with the pinnacle of the hierarchy being the broad policy objective. Subsequent levels get progressively more detailed. In the Canadian Forces, the doctrine hierarchy starts with defence policy like that described above, and then progresses through Canadian Forces doctrine to single-service doctrine, such as Army doctrine. "The development of sound doctrine is important to… developing training objectives and standards."[55]

As mentioned earlier, until 2002, there was some low-level Army doctrine related to urban operations. It was quite out-dated, and none of it was related specifically to training for urban operations. Since 2002, there has been some improvement at both the Canadian Forces and Army levels. New Canadian Forces (CF) doctrine has been ratified for CF Operations, Peace Support Operations, Non-Combatant Evacuation and Crowd Confrontation. The manuals containing this new doctrine have excellent procedures on how to plan and conduct the types of operations titled. However, given that each of these types of operations is likely to occur in urban areas, the manuals contain neither direct reference to such likelihood nor to the complexity of operating in urban terrain. There are references to urban intelligence and planning considerations, but there are no references to urban training. Indeed, the doctrine manual for Peace Support Operations (PSO) states, "The CF maintains the view that the best core training to meet the diverse demands of PSO is general-purpose military training with emphasis on basic combat and

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[54] North Atlantic Treaty Organization, "NATO Glossary…

[55] Department of National Defence, *Joint Doctrine from a CF Perspective*. J7 Doctrine Web Site; Available from http://www.dcds.forces.gc.ca/jointDoc/pages/j7doc_doctrine_e.asp; Internet; accessed 21 April 2005.

occupational skills."[56] Since the basis for this statement is open terrain combat skills, it is clearly not adequate for the urban environment. These CF doctrine manuals must be revised to reflect the new emphasis on urban operations.

The CF has additional doctrine related to strategic capability planning. The Strategic Capability Investment Plan (SCIP) includes a capability-based program for generating forces. Amongst other things, this program includes the ability to train personnel, research, test, and procure equipment, and produce the infrastructure and capabilities necessary to support military operations.[57] The SCIP also includes a CF transformation program in which capability designs for cold-war fighting environments and traditional peacekeeping scenarios will be transformed to capability designs for complex operations and environments.[58] The SCIP is a critical element to developing an urban operations training capability, as it the only approved plan towards which funding resources may be applied to the procurement of new capability. In other words, the requirement for an urban training capability must be included in the SCIP in order for funding to be assigned to its delivery.

Having looked at CF level doctrine, it is finally time to examine the developing urban operations doctrine in the Army. The Army's keystone document is titled *Advancing with Purpose : The Army Strategy : One Army, One Team, One Vision*, and was released

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[56] Department of National Defence. B-GJ-005-307/FP-030 *Joint Doctrine Manual : Peace Support Operations 2002-11-06 Page 9-11*. J7 Doctrine Web Site; Available from http://www.dcds.forces.gc.ca/jointDoc/docs/peaceSupportOps_e.asp; Internet; accessed 21 April 2005.

[57] Department of National Defence. *National Defence Strategic Capability Investment Plan Issue 1, November 2003*. Report on-line; available from http://www.vcds.forces.gc.ca/dgsp/pubs/rep-pub/ddm/scip/scipc01_e.asp; Internet; accessed 21 April 2005.

[58] *Ibid*.

in May 2002. While this document does not specifically mention urban operations, it does set the scene for Army Transformation away from its cold-war orientation. A key objective of the strategy is to deliver a combat-capable, sustainable force structure.

> The Army structure will produce combat ready forces capable of operating in the land environment for domestic and expeditionary imperatives… It must leverage technological advances in key areas to permit sufficient modernization to remain strategically relevant and tactically decisive on the future battlefield.[59]

A critical enabler for this objective is to "achieve instrumentation of the Canadian Manoeuvre Training Centre (CMTC)."[60] The CMTC will be examined later in the paper.

Another key objective of the Army Strategy is to manage readiness. As the land force generator, the Army must ensure that the right people with the right training are deployable at the right time is vif -2v21fa Th[(d.3 Boxthe i (Cssurba must6(t tassug5(x)byoperatco)5(mbat0

> consistency and mission success, although it is recognized that some tasks will remain personnel intensive.[62]

In order to measure the success of Army Transformation, feedback mechanisms will be essential. Feedback for delivering a future structure will include measures of the suitability and modernization of Army equipment, capability, interoperability and sustainability. Feedback for managing readiness will include measures of personnel strength, equipment serviceability, and individual and collective training levels.[63]

The key elements of the Army Strategy that prepare the ground work for a transformation are leveraging technological advances, remaining strategically relevant and tactically decisive on the future battlefield, and focusing investment in quantum leap improvements. In order achieve these, a concept for force employment was needed.

On 31 March 2004, the Chief of the Land Staff released a document titled *Purpose Defined : The Force Employment Concept for the Army : One Army, One Team, One Vision*. This document immediately identifies that "urban terrain will increasingly become the setting for conflict."[64] Indeed,

> "Operations will often be characterized by what has become known as the 'three-block-war,' where forces can expect to be providing humanitarian assistance in one part of a city, conducting peace support operations in another and fighting a lethal battle in yet a third. Moreover, the requirement to transition from one type of activity to the next could be measured in minutes."[65]

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[62] *Ibid*., 27.
[63] *Ibid*., 29.
[64] Department of National Defence, *Purpose Defined : The Force Employment Concept for the Army* (Kingston: Director General Land Concept Development, 31 March 2004), 4.
[65] *Ibid*.

Recall that the 'three-block-war' was included in the International Policy Statement. There is little doubt that the Government policy document was heavily influenced by the Army's Force Employment Concept. However, the notion of a 'three-block-war' is not a Canadian idea. The phrase was first coined in 1997 by General Charles C. Krulak, Commandant of the United States Marine Corps, in an address to the National Press Club in Washington. He described an asymmetrical battlefield where,

> In one moment in time, our service members will be feeding and clothing displaced refugees, providing humanitarian assistance. In the next moment, they will be holding two warring tribes part – conducting peacekeeping operations – and, finally, they will be fighting a highly lethal mid-intensity battle – all on the same day – all within three city blocks. It will be what we call the 'three block war.' In this environment, conventional doctrine and organizations may mean very little. It is an environment born of change… We can ignore the implications of change… or we can learn from history and prepare now for the inevitable battles to come.[66]

General Krulak also confirmed that "throughout modern history, we have consciously skirted fighting in urban areas… It is here that our enemies will challenge us… the urban areas will become the centers of gravity for our foes. Cities have the potential to negate much of our current technological advantages."[67]

The pillars of Army doctrine, according to the Force Employment Concept, will continue to be manoeuvre warfare and mission command.[68] These pillars are particularly suitable to urban operations. Manoeuvre warfare is a way of thinking that balances the use of moral and physical means to attack an enemy's will. Mission command is decentralized decision-making within the framework of the higher commander's intentions. In the

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[66] Charles C. Krulak, "The Three Block War," *Vital Speeches of the Day* Volume 64, Issue 5 (15 December 1997): 139.

[67] *Ibid*., 140.

[68] Department of National Defence, *Purpose Defined*…, 9-10.

complexity of urban terrain, these philosophies will give commanders and soldiers at all levels the latitude to act appropriately in response to the rapidly changing situation of the three-block-war. Instilling these philosophies in commanders and soldiers will require both education and training.

Soldiers and leaders are the essence of the Army. They must all be prepared for the stark reality of war. Regardless of their occupation or component (Special Operations, Maritime, Land, or Air), they "must have the skills to fight, survive and prevail in the complex battlespace of the 21st Century."[69] Interestingly, building combat power through the integration of the capabilities of each component is a key feature of the Force Employment Concept. The aim is to achieve synergistic effects whereby synchronized capabilities will produce overall results that are greater than the sum of their parts.

For their part, "land forces must be capable of dominating the situation in populated centres, where enemy forces will attempt to neutralize our technological advantages by blending in with the populace."[70] To do this, the Force Employment Concept identifies a number of specific operational capabilities that must be developed and mastered. Mastering an operational capability requires a corresponding training capability. The operational capabilities are derived from the five operational functions of Command, Sense, Act, Shield and Sustain.

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[69] *Ibid*., 12.
[70] *Ibid*., 15.

Command capabilities include but are not limited to mission command, command support, maintaining situational awareness, and communicating. Sense capabilities, which are intimately linked to command capabilities, include but are not limited to the collection of data through intelligence, surveillance, target acquisition and reconnaissance (ISTAR) sensors, and the processing of data into information that can be used to create knowledge and understanding. Act capabilities include but are not limited to effects-based operations, synchronization and task-tailored force structures. Shield capabilities include but are not limited to survivability and freedom of action through physical protection, maintenance of morale and protection of the cybernetic domain. Finally, sustain capabilities include but are not limited to material distribution, maintenance and health service support. Ultimately, "the ability to conduct close combat [and] to complete, if necessary, the physical destruction of the enemy, will remain a fundamental requirement"[71] for the Army.

The Force Employment Concept reiterates that the stand-up of the CMTC will be an essential step in implementing Army transformation. "It will furnish the Army with the ability to collectively train all elements across the five operational functions, ensuring coherent synchronization of capabilities to a common standard."[72] The CMTC, located in Wainwright, Alberta, is due to be completed and open for managed readiness training by early 2006. The CMTC will be equipped with a laser and radio-based, live and constructive weapon effects simulation (WES) system that will permit task forces to train as closely as possible to the way they would operate and fight. The CMTC will enable

[71] *Ibid*., 36.
[72] *Ibid*., 43.

manoeuvre warfare, mission command and virtually all capabilities to be exercised. It will provide feedback, as identified in the Army Strategy, to all soldiers and commanders. The only deficiency of the CMTC is that it is designed for open terrain operations and built in a training area that is open prairie with no urban terrain whatsoever. Advances in technology shall make it possible to include an urban training capability at the CMTC, based on live and constructive simulation that is seamlessly integrated with the WES system. Such a capability could be the basis of a multi-spectrum, urban training capability for the Army, and potentially for special operations, maritime and air forces. [73]

Doctrine also exists in the Army manual titled *Land Force Tactical Doctrine*. At the end of the manual, a section on operations in built-up areas is included in the chapter about operations in specific environments.[74] The arms specific doctrine manuals also make passing reference to fighting in built-up areas (FIBUA), as though it was an exception rather than a rule.

It is also important to examine training doctrine. The manual titled *Training Canada's Army* makes no mention of training for or in urban environments. However, it does articulate the levels of individual and collective training deemed essential to achieve operational readiness. Levels of Training 1 – 7 are progressive from the individual to the

[73] From 2001-2004, the author served in the Directorate of Land Requirements as the Project Director of the Weapon Effects Simulation project and as a result has intimate knowledge of the WES system, CMTC and emerging simulation technologies. His experience as Project Director provided the interest and impetus to develop the thesis that the Canadian Army needs an effective urban operations training capability.

[74] Department of National Defence, B-GL-300-002/FP-000 *Land Force Tactical Doctrine* (Kingston: Director of Army Doctrine, 16 May 1997), 8-7.

Brigade, [75] and are suited to various forms of simulation, depending on the level. The *Range Construction and Maintenance* manual does have a section titled FIBUA, but its only words are, "To be published later."[76]

It is clear that while the Army Strategy and Force Employment Concept documents have evolved to focus on urban operations, critical tactical doctrine and training manuals have not. In January 2004, a draft version of the Force Employment Concept being circulated within the Army, the Commander Land Force Doctrine and Training System commenced "development of a strategy to institutionalize urban operations in all individual and collective training, as well as develop a plan of action for development of urban training centres in Canada."[77] Direction was given to that effect, and many local initiatives to re-orient to an urban focus were started.

Army Transformation took several more steps towards urbanization in early November 2004. During the Army Council meeting, the Chief of the Land Staff (CLS) provided his Commander's Intent and directed that "The Army's focus must be the '3-Block War' identified by General Krulak."[78] The CLS also stated that, "We can expect that we will be operating in failed and failing states during the next twenty five years. To do this, the Army must be tactically capable, credible and decisive. Being able to operate in all parts

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[75] Department of National Defence, B-GL-300-008/FP-001 *Training Canada's Army* (Kingston: Director of Army Training, 30 August 2001), 22.

[76] Department of National Defence, B-GL-304-003/TS-002 *Range Construction and Maintenance* (Kingston: Director of Army Training, 27 August 1990), Chapter 10, Section 2.

[77] Major G.J. Burton, *Comd LFDTS Concept of Ops for Urban Trg* (Unclassified Minute Sheet and Draft E-mail, 19 January 2004).

[78] Major L.R. Mader, *Record of Decisions Army Council Meeting 1-4 November 2004* (Ottawa: Chief of the Land Staff: file 1180-1 (CLS) 15 December 2004), 4.

of the 3-Block War simultaneously must be our guiding vision."[79] Direction was given to the following critical urban training capability,

> The Canadian Manoeuvre Training Centre (CMTC) is the Army's centre of gravity in the near future as it is the means by which the concepts of the 3-Block War will be imparted to units and formations through practical training. This requirement means that the CMTC must have complex terrain that supports both horizontal and vertical operations as soon as possible. Additionally, investments will have to be made to provide complex terrain to other ranges and training areas (Valcartier, Petawawa and Gagetown).[80]

Training direction was amplified by the CLS in several ways. Firstly, "training for Combat Service Support (CSS) soldiers must be improved to provide them with a greater ability to operate and survive in combat situations."[81] Most importantly, "All training areas must be provided with complex terrain training facilities as soon as possible. This will not be easy but imaginative interim steps, such as laying out temporary urban areas using modular tentage, can greatly enhance the quality of training while we await more permanent complex terrain training sites."[82]

The last and most recent step towards optimizing training for urban operations is direction concerning range and training area management given in the *Strategic Operations and Resource Direction (SORD) 2005 Draft 1*. For Fiscal Year 2005/2006, the Land Force Doctrine and Training System (LFDTS) will assume leadership and overall responsibility for range and training area management. The priority for urban warfare training sites will be at the Combat Training Centre in Gagetown, New

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[79] *Ibid*., 14.
[80] *Ibid*., 4.
[81] *Ibid*., 15.
[82] *Ibid*., 16.

Brunswick and at the CMTC in Wainwright, Alberta.[83] The SORD also contains a section specifically concerning development of urban warfare training sites. Direction is given that LFDTS will seek funding and proceed in developing standardized Urban Warfare Training sites for the Army as a training development initiative.[84]

This approach to developing urban training capability is flawed. It is short term, providing virtually no time to develop standards and requirements. It only has the potential to address some aspects of the physical dimension of urban terrain by constructing some buildings and limited infrastructure. It will provide limited elements of live simulation capability by using existing targetry or by using WES, once it is fielded, for close combat engagements. The approach will not leverage new technology at all, particularly simulation technology. Any investment under this approach will not equate to a quantum leap in capability improvement and because of its short sightedness, will likely not have a funded support plan to maintain facilities once they are constructed. That being said, it might be able to provide a transitional urban training capability until such time as a more permanent solution can be implemented.

So far it is abundantly clear that the Army is making an effort to focus on urban operations. Backed by Government and Departmental policy, the Army is taking giant steps towards optimizing for urban or complex terrain operations. In order to round off the impression of forward movement, it would be useful to examine several examples of

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[83] Department of National Defence, *Strategic Operations and Resource Direction 2005 Draft 1* (Ottawa: Chief of the Land Staff, 2005), 3-1A-D-2/4.

[84] *Ibid*., 3-1A-D-4/4.

local initiatives to illustrate the ingenuity of local commanders who simply need to provide their soldiers with the best possible urban training opportunities.

The single largest initiative to conduct urban training occurred in Edmonton in April and May 2001. Exercise Urban Ram 2001 was sponsored and organized by 1 Canadian Mechanized Brigade Group (1 CMBG). This one-time-only exercise took advantage of the closing and demolition of Griesbach Barracks, which was representative of a very small city. Using the abandoned buildings inside the barracks, 1 CMBG established a series of urban training sites, each designed to accommodate different levels of training, from section to platoon to company to combat team. 1 CMBG rented a limited number of early-generation weapon effects simulation systems to permit soldier force-on-force engagements. The Director of Land Requirements was also able to procure a limited number of close engagement ammunition simulators (paintballs) for a buy-and-try trial during the exercise. An observer controller, or umpire organization was formed to control the activities and determine engagement results, as well as to provide feedback and after action review to exercise participants. A dedicated opposing force was created to provide a realistic, well-trained enemy to exercise participants.[85]

Exercise Urban Ram 2001 was an unqualified success and many tactical and institutional lessons were learned or re-learned. Because it was a one-time-only exercise, an extraordinary effort was required to organize and run it. Use of simulation technology was limited to what could be arranged within time, funding and availability constraints.

[85] Major S.B. Shreiber, *Exercise Urban Ram 2001 : Observer/Controller Post Ex Report* (Third Battalion, Princess Patricia's Canadian Light Infantry: file 3350-3/ UR 01 (3 PPCLI) 1 June 2001).

Sadly, the skills learned by all participants could only fade in the absence of follow-on urban training capability. No urban exercise of similar scale has been attempted since then.

Colonel Craig Hilton, Commander of the CMTC and the Army's Collective Training Authority (ACTA), has taken the initiative to create rudimentary 3-Block War urban terrain in the otherwise barren Wainwright prairie. According to Colonel Hilton, there are intentions to develop a fully instrumented urban operations training site that is seamlessly integrated with the WES system.[86] Until such time, several sites will be improvised within the Wainwright training area, predominantly using metal sea containers to represent buildings, but also including wood frame construction and military defensive stores.[87] The improvised facilities will include an area in Camp Wainwright to establish a National Command Element and a National Support Element. A tactical aerial port of debarkation (APOD) and a forward operating base will be established in the vicinity of Wainwright's Airfield 21. An isolated farm, tunnel complexes and a vertical village are being built for conducting dry training, and a land force live-fire village and an air-aviation strike village are being built for live fire training.[88] Construction of the improvised urban facilities should be complete by the end of 2005.

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[86] Colonel Craig Hilton, *Canadian Manoeuvre Training Centre Command Brief to 5 CMBG* Commander CMTC and Army Collective Training Authority Presentation (Wainwright, Alberta: CMTC, 12 April 2005).

[87] Personal interview with Colonel Hilton at the Canadian Forces College in Toronto, on 19 April 2005.

[88] Colonel Craig Hilton, *The Transformation of Collective Training* Commander CMTC and Army Collective Training Authority Presentation (Wainwright, Alberta: CMTC, 19 April 2005).

The next three examples are smaller scale urban training activities that occurred between late 2004 and early 2005. Each was reported in a newspaper, and this gives an idea of the profile and interest that urban training activities currently enjoy.

In October 2004, soldiers from the Third Battalion Princess Patricia's Canadian Light Infantry, a unit of the Regular Force, conducted close-quarter urban operations training at the lone urban skills house located in the Edmonton Garrison. This was preparation training for a battalion deployment to Fort Lewis, Washington, which has a forty-five building urban training village called Leschi Town. Leschi Town is instrumented to capture close-quarter engagement data for use in providing soldiers with accurate after action reviews. Second Lieutenant Matthew Dawe, a platoon commander who took part in the training, gave the following testimonial. "This training represents the evolution of warfare from more traditional large scale battles to operating in close-quarter urban centres."[89]

The next example is capped by the 6 February 2005 headline in the Halifax Herald, "Soldiers Hone Urban Ops Skills."[90] Over one hundred soldiers from 36 Canadian Brigade Group (36 CBG), a formation of the Reserve Force, participated in Exercise Sky Trooper which took place in downtown Halifax and at a disused military housing site in Shearwater, Nova Scotia. Soldiers practiced helicopter loading and unloading at Windsor Park and Halifax Commons before flying to Dartmouth's Shannon Park. Local civilians

[89] Lieutenant (Navy) Petra Smith, "Troops clear building, rescue casualties and evacuate non-combatant forces during training," *The Maple Leaf*, Volume 8, Number 5 (2 February 2005), 10.

[90] Kristen Lipscombe, "Soldiers hone urban ops skills," *The Halifax Herald Limited*, 6 February 2005.

commented that, "It kind of gives you an idea of what it would feel like to be in an occupied country."[91] The exercise was in preparation for further urban training at Fort Pickett, Virginia.

Later in February 2005, the follow-on Exercise Southbound Trooper V, saw over three hundred reservists from Nova Scotia and Prince Edward Island descend on the old American fort which is now used as a manoeuvre training base. This was the fourth year that 36 CBG traveled to the United States to conduct urban training. The Fort Pickett urban training facilities are significantly more basic than those described at Fort Lewis, and consist solely of non-instrumented, cinder block buildings. Canadian Reserve engineers even had to construct some plywood buildings to be used by the enemy in the final assault. Most importantly, Canadian Reserve forces were able to take advantage of recent urban operations experience gained by American soldiers. They practiced convoy and ambush drills, house clearing, casualty evacuation and treatment, communications and civil-military coordination.[92]

These local initiatives are indicative of the urge within the Army to reorient towards operations in urban terrain. They are by no means the only such initiatives. Note also that air and aviation forces have a role to play in urban operations. There are themes common to each of these activities. There are very limited facilities for conducting urban training in Canada, short of operating in real Canadian cities as the Halifax militia did. Because of this, there is no commonality of training from one activity to the next, and

[91] Ibid.

[92] Kristen Lipscombe, "Troops Train for Peacekeeping : Exercise at American fort simulates conflict in urban area," *The Halifax Herald Limited*, 28 February 2005.

each activity requires a significant effort to plan and conduct. Additionally, the excellent skills learned during these activities fade soon afterwards without an ability to conduct continuation training. Urban training facilities exist in the United States and attract Canadian units because they incorporate simulation technology, after action review instrumentation and human expertise to provide objective feedback. The cost and effort to travel to the United States is significant and such opportunities are dependant on the facilities being available. Skill fade is also a problem.

Finally, there is a strong desire to make urban training as realistic as possible. Metal sea containers are not very realistic. One-time-only opportunities such as disused barracks or downtown parks are not very representative of potential deployment areas and do not offer commonality across the Army. Simulation technology greatly improves training realism, but it is extremely costly, and individual units cannot reasonably be expected to procure and sustain their own. Intentions are honourable, but mean nothing unless properly coordinated and funded.

There is clearly an urban operations training capability deficiency in the Canadian Army. There is an equally clear requirement for such a training capability. It must be standardized and available to Regular and Reserve units throughout Canada. Because air and aviation forces must support land operations in the urban environment, there is an absolute necessity that urban training capabilities include air component input. Implementing a sustainable, standardized urban operations training capability that leverages technology to provide quantum leap improvement will only be deliverable if

centrally controlled and funded. The obvious deduction is to create a joint capital project team to develop and deliver an urban operations training capability.

4. Identifying Urban Training Capability Requirements

Having established that the Canadian Army has an urban operations training capability deficiency, and that the will to create such a capability exists, what sort of capability must it have and how will it get there? Fortunately, there are a variety of sources from which deductions can be made about capability requirements. This section of the research paper will examine some interesting lessons learned from some unusual sources. Since Canada is not alone in its need for an urban training capability, a brief overview of some allied initiatives will be given as food for thought. Once training requirements are deduced and summarized, some current and emerging technologies will be illustrated as potentially suitable for delivering effective urban operations training. In order for the Army to achieve its desired end state, the notion of a capital project will be proposed.

Because this section will introduce modeling and simulation, a few more definitions are in order. Modeling and simulation refers to "the use of models, including emulators (a representation of a system by a model), prototypes, simulators and stimulators (hardware that simulates other entities) either statistically or over time, to develop data as a basis for making managerial or technical decisions."[93] There are three broad categories of simulation used in military training. Live simulation involves real people operating real

[93] Lieutenant-Colonel R. Russell, *Modeling and Simulation* Presentation to CFLO Conference 15-19 October 2001. (Alexandria Virginia: Canadian Forces Liaison Officer AMCHQ, 15 October 2001).

systems, constructive simulation involves simulated people operating simulated systems, and virtual simulation involves real people operating simulated systems.[94]

The first appropriate lesson learned stems from the 1994 Report of the Auditor General of Canada. The Auditor General found that "Unlike the United States Army, the Canadian Forces does not validate land field exercises and therefore cannot assess whether exercises meet operational requirements."[95] The recommendation was that the Department of National Defence should set up "an objective, verifiable operational readiness reporting system… Where quantified measures are not appropriate, clear standards for subjective rating should exist."[96] With the pending implementation of the CMTC and its WES system, the Army will have a system to objectively validate readiness, but only from an open terrain operations perspective. Until the CMTC has a fully instrumented urban training capability, clear standards for subjective rating must be developed. These standards must be promulgated to all Army units that conduct urban training until they have a means to objectively verify readiness.

The 1996 Report of the Auditor General of Canada had a focus on peacekeeping. Several urban training related issues were raised. A major concern was Peacekeeper Stress, especially in the Militia. The Auditor General found that Reservist participation in peacekeeping operations had skyrocketed, and that they generally lacked adequate training before joining their deployment units. In response, the Army is "continuing

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[94] *Ibid*.

[95] Office of the Auditor General of Canada, *1994 Report of the Auditor General of Canada, Chapter 24 – National Defence*. Report on-line; available from http://www.oag-bvg.gc.ca/domino/reports.nsf/html/94menu_e.html; Internet; accessed 11 December 2004, article 24.91.

[96] *Ibid*., article 24.93.

military training that can effectively inoculate soldiers against peacekeeping stress. High levels of unit morale, stamina, technical competence, familiarity with and confidence in weapon systems, and field training are all known to reduce stress in soldiers."[97] The Auditor General recommended that "the Department should continue to develop and implement a program to manage stress among its peacekeepers… The active involvement of senior management and command personnel will be necessary."[98]

Several deductions can be gleaned from this finding. Firstly, Reservists must have the capability to train close to their home locations if they are to be prepared to join Regular units on deployment. In order to inoculate soldiers and commanders to the stress of urban operations, it is vital that training be as realistic as possible. Reservists are not the only soldiers who may suffer from stress. Regular soldiers are also susceptible to stress, particularly those in support trades who have fewer opportunities to inoculate themselves through realistic training. All soldiers preparing for deployment must be inoculated against stress by participating in realistic urban operations training. Stress and stress inoculation will be discussed in greater detail later.

The 1996 report also observed the importance of civil-military co-operation, working with non-governmental agencies, refugee handling and negotiation skills. Of particular note, "more remains to be done to train individual soldiers on Rules of Engagement."[99] These requirements fall clearly inside the boundaries of the 3-Block War. Soldiers and

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[97] Office of the Auditor General of Canada, *1996 Report of the Auditor General of Canada, Chapter 7 – National Defence*. Report on-line; available from http://www.oag-bvg.gc.ca/domino/reports.nsf/html/96menu_e.html; Internet; accessed 11 December 2004, article 7.59.

[98] *Ibid*.

[99] *Ibid*., article 7.105.

commanders must become intimately familiar with the various organizations and individuals with whom they will work on operations. To do this, it will be vital that information packages be developed early and updated throughout the deployment training process, and that that information be incorporated into all training activities. The actual Rules of Engagement must be used throughout the training process.

A vital Canadian source of urban operations lessons learned comes from the Army Lessons Learned Centre (ALLC) which in 2002 published its journal *Dispatches* on the subject of "Training for Urban Operations."[100] Contained in its forty two pages is a goldmine of information that includes strategic, operational and tactical lessons from urban operations, some fundamentals of training for urban operations, and finally some tips on the conduct of training for urban operations. The lessons are derived from historic and contemporary urban operations, and significant attention is given to the lessons learned from Exercise Urban Ram 2001, which has already been described earlier. Of particular note is the warning, "the lessons highlighted have repeated themselves over and over, and have been paid for in blood. Ignore them at your peril!"[101]

This examination will focus on those lessons that are germane to developing training capability requirements, and will start by highlighting the most important fundamentals of urban training. Physical fitness is identified as a key requirement for training and

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[100] Department of National Defence, "Training for Urban Operations." *Despatches Lessons Learned for Soldiers*. Volume 9 Number 2. Kingston: The Army Lessons Learned Centre, May 2002; available from http://armyapp.dnd.ca/ALLC/Downloads/dispatch/Vol_9/Vol9No2_eng.pdf; Internet; accessed 26 January 2005.

[101] *Ibid*., 5.

conduct of urban operations, particularly upper body strength.[102] The suggestion is to develop urban obstacle courses for fitness training. Urban combat shooting skills are critical, particularly the ability to discriminate targets and to shoot at shorter ranges. Sharpshooters or snipers are also critical in an urban environment.[103] In order to hone urban marksmanship skills, the Army must have a progressive system for training urban battle shooters. A combination of dry and live fire simulation capabilities would be required for such a system.

Urban combat movement skills must "focus on the ability to think in 360 degrees and in three dimensions."[104] The only sure way to develop these movement skills is to train in an urban setting. A logical deduction is to train in terrain that replicates real mission areas. This would enhance movement skills at the same time as familiarizing soldiers in advance with the terrain on which they will operate. This is a capability that offers quantum leap improvement potential. Urban camouflage and concealment skills are radically different than similar skills for open terrain. Lights and shadows, colours, texture and shapes must be considered. Most importantly, dogs and other domestic pets, as well as civilian populations, have an effect on soldiers' abilities to conceal themselves.[105] An urban training capability must therefore contain these elements of urban realism to expose soldiers to their effects and to enable to them to develop experience in overcoming them.

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[102] *Ibid*., 25.
[103] *Ibid*.
[104] *Ibid*., 26.
[105] *Ibid*.

The final fundamental of urban training is that soldiers must have an understanding of building construction techniques. Construction type will affect weapon effects and the ability to build effective defensive works. Soldiers must also receive training in urban engineering to accomplish basic tasks such as turning on and off gas, electricity and water, locating and effecting basic repairs to telephone systems, and locating useful infrastructure by reading urban plans and blueprints.[106] Construction techniques are different throughout the world therefore exposure to a variety of constructions is required. Mission specific urban training must include near exact replica construction to provide the maximum training value. This requirement can be delivered progressively using different simulation technologies.

The ALLC confirms that realism in urban training is critical. One approach to providing realism is to conduct tactical exercises without troops (TEWT)[107] within a local community. This approach is useful for developing knowledge in small groups of leaders, and is particularly relevant for defence of Canada tasks. TEWTs can be augmented with participation by local security and civil services. Significant preparation would be required for such TEWTs, but the information packages and lessons learned resulting from them would be valuable in the eventuality of a real crisis. TEWTs may also be conducted in mission areas, although security requirements may limit numbers who can participate. Again, if conducted in conjunction with local security forces, TEWTs offer the opportunity to develop good working relationships that may be critical on operations.

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[106] *Ibid*., 27-28.
[107] *Ibid*., 29.

While TEWTs are good for small groups of leaders, significant time must be dedicated to training soldiers in the tactics, techniques and procedures (TTP) of urban operations. The ALLC suggests that live simulation in purpose-built urban operations training sites is ideal for this requirement. To be effective, urban training sites must have a number of characteristics. Urban terrain requires three dimensional battlespace in the form of multi-storey, multi-room buildings, as well as underground sewers or tunnels. Civilians, including local government and non-governmental organization (NGO) representatives must exist in the battlespace of the training site. The site must be robust and adequate in size to accommodate a host of combat and support vehicles. The site must permit weapon effects simulation inside and outside buildings, and be instrumented to capture engagement data for after action review purposes. Finally, for increased realism, urban training sites require the "clutter found in real world cities [like] furniture, wrecked cars and trash."[108]

Finally, for live simulation to be completely effective, the ALLC states that there must be observer controllers and an opposing force (OPFOR).[109] Observer controllers act as mentors to the trainees. They control and observe the training to provide feedback and after action review and they enhance safety. The OPFOR simulates the enemy as realistically as possible. Mistakes made and overcome in training with an OPFOR will elevate the morale and readiness level of a unit, enhanced performance on operations, and ultimately improve the chance of mission success.

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[108] *Ibid*., 30.
[109] *Ibid*., 32.

Our American and Australian allies involved in contemporary operations in Iraq indicate another significant urban training capability requirement. "Training is continuous, whether in a combat zone or not... Marines must be continuously trained otherwise they will lose proficiency in MOUT (Military Operations in Urban Terrain) skills learned through experience during the attack."[110] And as during training at home, "constructive criticism should be encouraged… telling good and bad observations."[111] To illustrate the importance of in-theatre urban training, the US Army procured two mobile MOUT facilities, one being in use at the Baghdad airport and the other in Afghanistan.[112] The Australians confirm the requirement to conduct in-theatre training to acclimatize personnel to the terrain and to operating with allies.[113]

Knowledge is a requirement for urban operations training. The US Army and the US Marine Corps are world leaders in training for and conducting contemporary urban operations. Virtually all of their urban operations knowledge was paid for with soldiers' blood. The US has developed urban operations information and doctrine for waging the 3-Block War that the Canadian Forces, especially the Army, should not ignore. The US Joint Chiefs of Staff have produced a *Handbook for Joint Urban Operations*, the aim of

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[110] Sergeant E.J. Catagnus Jr., Corporal B.Z. Edison, Lance Corporal J.D. Keeling, and Lance Corporal D.A. Moon, "Lessons Learned: Infantry Squad Tactics in Military Operations in Urban Terrain During Operation Phantom Fury in Fallujah, Iraq," (Fallujah, Iraq: Section 1, Scout/Sniper Platoon, 3rd Battalion, 5th Marines, January 2005), 11.

[111] *Ibid*.

[112] Lieutenant-Colonel R. Ryder-Burbidge, *Urban Operations – Several Unrelated Points from Iraq* (Canadian Forces Liaison Officer United States Army Training and Doctrine Command: file 1630-1 (CFLO TRADOC) 10 April 2003), 1.

[113] Australia Department of Defence, *The War in Iraq ; ADF Operations in the Middle East in 2003*. Available from Http://www.defence.gov.au/publications/lessons.pdf; Internet; accessed 26 January 2005.

which is to inform "joint force commanders, their staffs and other interested parties with fundamental principles and operational-level considerations for the conduct of joint urban operations."[114] Of critical importance to Canada is the US Army Field Manual titled, *Combined Arms Operations in Urban Terrain*.[115] This manual is a compendium of urban doctrine and TTPs that cover every aspect of operating in urban terrain. At the very least, both manuals should be considered required reading for all Canadian officers, and all non-commissioned officers should be given formal instruction on the latter. At best, they should be adopted as Canadian manuals and modified to meet any specific Canadian requirements. Taking either of these measures will ensure that the lessons learned do not have to be paid for again, and will make Canadian Forces more interoperable with our principal ally, the United States.

The lessons learned mentioned above relate to urban operations knowledge and skills training requirements in a very general sense. There are more complicated human issues that must also be addressed if urban training is to be effective. As discussed earlier, the Auditor General identified Peacekeeper Stress as an issue of concern for unit's deploying on overseas missions. Because of the complexity of operating in urban terrain, the potential for increased stress is high. Stress can detrimentally affect a soldier's performance, particularly during operations, which in turn will impact unit morale, cohesion and safety. A number of studies have identified the problem and have proposed solutions to both prevent stress injuries and to treat them if they occur.

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[114] United States The Joint Staff, The Pentagon, *Handbook for Joint Urban Operations* (Washington, DC: The Pentagon, 17 May 2000), preamble.

[115] United States Department of the Army, *Field Manual Number 3-06.11 Combined Arms Operations in Urban Terrain* (Washington, DC: Headquarters Department of the Army, 28 February 2002),

"Peacekeeper's stress syndrome is now formally acknowledged as a unique problem of UN peacekeepers."[116] A number of other psychiatric or psychological conditions have also been diagnosed including, "acute stress disorder, Post Traumatic Stress Disorder (PTSD), conversion reaction… survivor's guilt syndrome."[117] PTSD is a major psychological problem and includes breakdowns known as, "combat stress reaction, battle fatigue, shell shock and war neurosis."[118] To put a Canadian perspective on this problem, a study determined that Canadian soldiers suffered a 15% incidence of PTSD during peacekeeping operations to the former Yugoslavia in 1992 and 1993.[119] The primary prevention is preparation to cope with stressful events, which highlights the importance of pre-deployment training.

A US study of PTSD in military medical personnel revealed that exposure to wounded and dead soldiers was a significant form of stress. Exacerbating this situation is the fact that, "both active and reserve medical training programs fail to expose trainees to handling real casualties."[120] Exposure to casualties also stresses all other soldiers. While it is possible for medical personnel to be seconded to civilian hospitals for such exposure, other soldiers can not. Additionally, civilian hospitals do not offer the same degree of

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[116] Jun Shigemura and Soichiro Nomura, "Mental Health Issues of Peacekeeping Workers," *Psychiatry and Clinical Neurosciences* 56 (2002): 484.

[117] *Ibid*.

[118] *Ibid*., 487.

[119] D.G. Passey and D.J. Crockett. *Psychological Consequences of Exposure to U.N. Peacekeeping Duties in the Former Yugoslavia*. Report to the Surgeon General. (Ottawa, Canada, 1995) quoted in Jun Shigemura and Soichiro Nomura, "Mental Health Issues of Peacekeeping Workers," *Psychiatry and Clinical Neurosciences* 56 (2002): 484.

[120] Captain Michael S. Baker and Follin Armfield, "Preventing Post-Traumatic Stress Disorders in Military Medical Personnel," *Military Medicine* Volume 161 (May 1996): 263.

discomfort or danger as an urban theatre of operations. There is therefore a requirement for realistic simulation of casualties, in near real time, for all soldiers in all urban training.

Stress inoculation therapy (SIT) can be used prior to deployment, and is most effective when delivered to unit groups as it helps maintain unit morale and cohesion. "SIT is analogous to medical inoculation, trying to build psychological antibodies – coping skills – and to enhance resistance through exposure to stimuli that are strong enough to arouse defenses without being so powerful as to overcome them."[121] The aim is to desensitize soldiers to the trauma of combat. "Exposure to realistic scenarios, group discussions with experienced veterans, and training by mental health professionals in techniques of coping with stress can prepare individuals for stressful events."[122] Rigorous realistic training, and stress inoculation therapy specific to urban operations is required to help prevent stress related injuries.

Stress prevention will help soldiers maintain performance learned during training. It will not however provide the quantum leap improvement in performance that is ultimately sought. In order to create such improvement, soldiers and leaders need information in forms that best permit transfer and retention for planning and decision making. Human factors scientists at Defence Research and Development Canada Toronto have been investigating soldier information requirements for urban operations, and have conducted several experiments to determine the best way to improve performance. A critical area of research has been to determine the best method of visualizing urban terrain for mission

planning, rehearsal and operational way finding. Experiments have included terrain visualization for urban street way finding,[123] in-building way finding,[124] and high density urban way finding.[125] Overall, results tend to indicate that performance improves when virtual three dimensional (3D) models of urban terrain are used versus traditional two dimensional (2D) models such as maps and diagrams. The experiments recognize the limitations associated with off-the-shelf virtual simulation technologies, which are designed for commercial marketing.

Experimentation has led to the following technology improvement suggestions. The creation of hybrid 2D/3D virtual tools would blend the positive aspects of 2D into 3D, leading to best information available. The virtual model fidelity must be improved to include detail on building materials for walls and floors, views out of windows and varying light levels. Soldiers suggested a more user friendly human machine control interface. Most importantly, soldiers need thorough training to operate the virtual environment effectively.[126]

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[123] D.W. Tack, H.J. Woods and J.K. Kumagai, "Investigation of Alternate Visualization Methods in Urban Operations: Urban Streets Terrain Environment," Draft Experiment Report DRDC Toronto No. CR-2004-174. Soldier Information Requirements Technology Demonstration project. (Toronto: Defence Research and Development Canada – Toronto, October 2002).

[124] D.W. Tack, H.J. Woods and J.K. Kumagai, "Alternative Visualization Methods in Urban Operations: In-Building Terrain Environment." Draft Experiment Report DRDC Toronto No. CR-2004-175. Soldier Information Requirements Technology Demonstration project. (Toronto: Defence Research and Development Canada – Toronto, October 2002).

[125] D.W. Tack and Heather J. Woods, "Alternative Visualization Methods for High Density Urban Operations," Draft Experiment Report DRDC Toronto. Soldier Information Requirements Technology Demonstration Project. (Toronto: Defence Research and Development Canada – Toronto, November 2004).

[126] D.W. Tack, H.J. Woods and J.K. Kumagai, "Alternative Visualization Methods in Urban Operations: In-Building…, 46-47.

If information is critical to soldiers and leaders, it is logical that the information must be as near real time as possible for relevance to the mission at hand. In the same way that aerial photos become time expired due to changes in the terrain from bombing, demolitions, and defensive works, so too, do 3D models become outdated. This leads to the deduction that if 3D models are used for situational awareness, then there must be a capability to rapidly create them and update them with the latest possible information about the terrain. A rapid terrain visualization capability would be extremely useful during pre-deployment training to familiarize soldiers with their area of operations before they arrive in a theatre.

A further deduction can be made that if rapid terrain visualization is performance enhancing during training, then it would likely have a similar effect in enhancing performance during operations. This leads to the potential of using the same simulation capability in both training and operations. The mind boggles at the potential that such a capability could be embedded in an operational situation awareness system.

The examination of lessons learned would not be complete without an overview of allied urban training capability. For this paper, the capability within NATO will be examined. NATO has expended significant effort studying urban operations training capability. In a 2002 investigation into urban operations in the year 2020, the NATO RTO made specific findings about training for urban operations. Firstly, “training is the responsibility of

individual NATO nations, [but] the lessons learned from training can be shared."[127] This is standard NATO policy that appears to discount combined training. The reality is that while some countries do conduct combined training exercises some of the time, their training systems are only established and funded to support the training of their own forces. Additionally, nations tend to support their national industries, particularly when it comes to procuring high technology items like simulation systems. From a simulation perspective, combined training would in all likelihood be impossible thanks to different operating systems, frequency bands or sensitive intellectual property rights. The frank reality of this statement is that interoperability of training systems is not required or expected.

The RTO also determined that urban training "should be focused upon joint and coalition operations in urban areas, featuring all aspects of the 3-Block War… [that] there is a need for more urban-specific training facilities… [and] that there is a need to combine these facilities with simulation systems to portray more accurately the complexity of the urban battlespace."[128] These determinations support similar deductions made earlier regarding Canada's requirements.

Most importantly, the RTO determined a "requirement to train and educate commanders in the cultural, political and ethnic background pertaining to the urban area."[129] This truly is a critical requirement for training but only scratches the surface of the true scale

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[127] North Atlantic Treaty Organization Research and Technology Organization, *Report By The RTO Study Group Into Urban Operations In The Year 2020 For The NATO Research And Technology Organisation* (North Atlantic Treaty Organization, 24 May 2002), art. 6.4.3.

[128] *Ibid*.

[129] *Ibid*.

of the requirement. All soldiers who deploy must receive training in this area as it is they in particular who must meet local inhabitants face to face. Pre-deployment training must include cultural awareness and be given to all soldiers and commanders. Commanders should receive additional education commensurate with their duties.

More recently, the RTO has initiated a study on *Urban Combat Advanced Training Technology (UCATT)*. The aim of this study is to "investigate and recommend a generic set of unclassified requirements to be made available for all NATO/PfP (Partners for Peace) nations to inform interoperability requirements and standards for development of instrumented MOUT capability."[130] There are eight countries participating in this allied study. Canada is not one of them. By not participating, Canada will likely miss valuable experience that cannot be replicated in a final report. In light of the importance the Canadian Government has placed on the 3-Block War, Canada should join the UCATT study group in order to gain feedback in progress.

The Army Sub Group (ASG) of the NATO Training Group (NTG) has established a Training Simulation Working Group (TSWG) which meets several times per year to share information and lessons learned. Canada provides the Chair to the TSWG. Although the TSWG deals with all training simulation, it has some interest in urban training simulation, including individual, collective and command and staff training.[131]

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[130] North Atlantic Treaty Organization Research and Technology Organization. *Overview of Urban related NATO (RTO studies): Aim and Participants* (The Netherlands: TNO Physics and Electronics Laboratory, April 2004), 2.

[131] Major B.J. Chapman and Lieutenant-Colonel J.L. Cyr, *Record of Proceedings of the NATO Training Group/Army Sub Group/Training Simulation Working Group Meeting 1/04 Held in Ankara, Turkey 15-19 March 2004* (Army Simulation Centre: file 2455-1-1(ASC) 31 March 2004), 4.

Canada should continue to participate in the TSWG. The NTG also has a low-level FIBUA/MOUT Working Group which meets every six months to share information about urban doctrine, training and operational lessons learned.[132] Canada participates in this Working Group and should continue to do so.

Of the NATO nations, the US is recognized as the leader in urban operations experience. While the US Marines Corps played a prominent role in developing early urban operations concepts, the US Army has become predominant in the field. The US Army approach to urban operations has included the MOUT Advanced Concepts and Technology Demonstrations (ACTD) which investigated technology and verified tactics, and the Combined Arms MOUT Task Force (CAMTF) which reviewed and updated doctrine, and developed training requirements. They have also created a contracting vehicle called MOUT/Restrictive Terrain Indefinite Delivery/Indefinite Quantity Contract (MOUT/RT ID/IQ) to develop and deliver instrumentation to training sites.[133]

The work of the CAMTF is particularly important for this examination. The CAMTF has identified several specific urban training facility requirements of which Canada would have similar requirements. The first is a requirement for a live fire breach house to practice mechanical, thermal, ballistic and explosive breaching. The second is a requirement for a live fire shoot house to gain confidence in conducting close quarter live fire operations. The third requirement is an urban assault course to practice focused

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[132] Johnny W. Brooks, "NATO FIBUA/MOUT Working Group 3-8 October 2004," Trip Report, (United States Infantry School, Joint Urban Operations Support, 2004).

[133] Gary I. Washam, *Status of MOUT Instrumentation* Presentation to Director Land Requirements 3-6 Project Director Weapon Effects Simulation on 5 August 2003 (San Diego, California: Cubic Defense Applications Inc., 2003).

sequential training in basic fundamentals. The final requirement is a collective training facility to provide a realistic environment for all combined arms force, special forces and civilian agency training.[134]

The US Army has a number of urban training facilities around the country. For example, there are seven instrumented, live simulation, urban training sites. Unfortunately, none of them are standardized in either layout or instrumentation. On a larger scale, this is similar to Canada's situation, where local initiatives have left a legacy of good intentions that provide some capability. The US Army does have a plan to commence standardization of its urban training facilities starting with Fort Lewis, Washington. This supports a similar approach for Canada deduced already.

Some other NATO nations have begun to develop urban training capability. Sweden, The Netherlands, Turkey, Belgium, Canada, the United Kingdom, Portugal and Norway have some form of Urban Leader Course designed to train the trainer. The aim is to provide officers and NCOs with the tools to train units on proper tactics, techniques and procedures for urban operations.[135] France, the United Kingdom, Turkey and Norway have urban training sites, but as yet, none have full instrumentation for live simulation data capture. The United Kingdom has two training teams to act as observer controllers and provide after action reviews in their sites in Cope Hill Down, England and

[134] *Ibid*.
[135] Johnny W. Brooks, "NATO FIBUA/MOUT Working Group…

Sennelager, Germany. France has instructors at its site at Sissonne that is intended to train up to a combined arms company team at once.[136]

As has been shown, there are myriad lessons from which to glean requirements for an urban operations training capability. The list of examples highlighted in this essay is by no means finite. It is possible to summarize those deductions in the distinct capability areas of urban operations standards, knowledge, training system and realism.

The ultimate standard is that Canada is responsible for training its own soldiers. The goal is to seek quantum leap improvement in performance on domestic and international urban operations that results in mission success and a safe return home. Standards for urban training and readiness must be objective and if not, clear standards for subjective rating must be developed. Participation in urban training must be for all Regular and Reserve soldiers and officers, in all branches and corps, with no exceptions. Joint urban training, particularly with air and aviation, is also a critical requirement. Standards of urban training capability must be the same in all locations across Canada. Standards are policy oriented and can be implemented quickly with minimal cost.

Knowledge is information and skills gained through experience or education.[137] Indeed, the Army's collective knowledge about urban training and operations is the foundation resident in doctrine from which soldier and leader knowledge is developed. To maintain its urban operations knowledge the Army must participate actively in all allied urban

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[136] *Ibid*.
[137] Catherine Soanes, Ed., *The Pocket Oxford English Dictionary*…, 502.

operations forums, and not merely wait for their annual reports. Canada must consider adopting US urban operations doctrine or making it required reading for officers. Domestic and international information packages, including cultural awareness, must be developed and studied in preparation for deployment. Rules of engagement, construction techniques, urban engineering and weapon effects must be taught to and studied by all soldiers. This short list is not exhaustive. Development of urban operations knowledge is a long term investment that must be coordinated and funded.

An urban operations training system is required to provide the conditions for developing improved performance. The system must include individual, collective and command and staff training capability. Virtual, live and constructive simulation must be exploited. The Army requires urban training capability at home and in-theatre. Facilities such as urban training sites and live fire ranges are required. They must be standardized and interoperable, and to the greatest extent possible, simulation capability must be embedded in operational systems. An urban operations training system represents a significant, long term investment in technology, infrastructure and life cycle support. If centrally coordinated and funded, maximum capability could be procured for the best cost.

Finally, urban realism is the critical requirement that will energize the standards, knowledge and training system. Replication of the complexity of urban terrain will help inoculate against stress as well as push skills like fitness, movement and shooting to higher limits. The introduction of civilian authorities, non-governmental organizations, and refugees and displaced persons to training will improve negotiation, target

discrimination, and rules of engagement skills. Investing in realism will add significant value to standards, knowledge and the training system. The costs for realism would be included as factors of each of those capability areas.

5. The Road to Mission Success

Realism is particularly relevant to an urban operations training system. There are current and emerging simulation technologies that could be integrated to provide the ultimate urban operations inoculation experiences, short of conducting actual urban operations. These technologies would give new meaning to the adage 'train as closely as possible to the way you will operate.' Interestingly, a number of innovative Canadian companies are in the forefront of developing novel urban operations training capability. Of course, there are also American companies in the same business. A sample of virtual and live simulation technologies will now be highlighted as potential capabilities for a Canadian urban operations training system.

Thales Canada Inc., of Ottawa, Ontario, is collaborating with the Urban Operations Team at Defence Research and Development Canada in Valcartier, Quebec to develop an artificial intelligence based system for command and control of urban operations. Known as the AI Think project, its aim is "to develop a prototype command and control artificial intelligence based system for command and control (C2) in urban operations with the view to enhance the commander's understanding, facilitate his decision-making, [and] augment his information management and orders process."[138]

[138] Richard Grenier and Dr. Luc Pigeon, "Outline Project Description : Artifical-Intelligence based system for C4I in Urban Operations," (Quebec: Thales Canada, 5 November 2004), 1.

The AI Think concept includes five capabilities for operating in an urban environment. The first component aims "to assist commanders in developing, testing and producing initial courses of action (COA) by enhancing their information sharing capabilities while synchronizing human and machine knowledge."[139] The second component will "provide the capability for dynamic optimal road selection within a complex/urban environment… [and] will be based on, but not limited to spatial and temporal information, inaccuracies and uncertainties found within HUMINT (Human Intelligence), IMINT (Image Intelligence), SIGINT (Signals Intelligence) and existing knowledge of the area."[140] The third component will "identify and optimize the events that could be undertaken by the friendly force to optimize their influence on the operations at hand."[141] The fourth component will "assist the operational and tactical 'all source [intelligence] cell' by becoming the system for information dissemination to both human and machine."[142] The fifth and final component of the AI Think project will exploit the wide array of available sensors to create accurate depictions of the overall situation despite the potential misinformation and malformed conclusions that could occur due to direct enemy deceptions, sensor limitations or human errors."[143]

Such an artificial intelligence capability has the potential to revolutionize terrain visualization and situation awareness. It has excellent potential for both training and operations and could reside in virtual reality or live simulation systems and in operational situation awareness systems.

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[139] *Ibid*.
[140] *Ibid*.
[141] *Ibid*., 2.
[142] *Ibid*.
[143] *Ibid*.

Another very promising virtual reality simulation system has been developed by Object Raku Technology Inc., of Vancouver, British Columbia. Known as the Sextant Virtual Warfighting Tool (VWT) and Mission Rehearsal Central (MRC), it permits rapid 3D virtual world generation for mission planning and rehearsal.[144] The Sextant VWT and MRC were developed specifically for urban operations training under the U.S. MOUT ACTD that was mentioned earlier. The Sextant VWT and MRC provide a contingency/in-garrison and enroute mission planning and rehearsal capability that is laptop based and fully deployable, and capable of automatic 3D scene generation with on-the-fly scene and situation modification. It allows multi-user interactive 3D web-based rehearsal and has low bandwidth dissemination.[145] Sextant is currently in use with the U.S. National Geospacial-Intelligence Agency, the U.S. Army Topographic Engineering Center, and the U.S. Marine Corps as a mission planning tool. It will also be used for dynamic navigation in the U.S. Army Enhanced Urban Tactical Planner.[146]

An interesting feature of Sextant is its capability to rapidly generate 3D terrain, making rapid terrain visualization in near real time possible. It can use terrain data in a number of formats to generate the 3D virtual world. Sources include vector data, photography, known intelligence of building details, digital terrain elevation data (DTED), and even LIDAR (Light Detecting and Ranging) data.[147] The 3D model will be as accurate as the

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[144] Janette D. Hooper, "Deployable Networked Mission Rehearsal with Rapid Integral Scene Generation," (Object Raku Technology Inc. white paper presented at the IMAGE 2004 Conference, Scottsdale, Arizona, 12-16 July 2004), 1.

[145] *Ibid*., 7.

[146] *Ibid*.

[147] *Ibid*., 2.

information used to create it, giving the capability to initiate and improve models, in near real time, as the urban operation situation changes. This feature will provide users with the best possible knowledge of the urban terrain and allow them to rehearse on that terrain in virtual reality.

Object Raku Technology identified and tested a promising technology for heightening the fidelity of 3D virtual models. Tactical Geographics, LLC of Tucson, Arizona, has developed the Red Hen Global Positioning System (GPS) referenced video system that collects geo-referenced imagery. The Red Hen system is portable and can be taken on patrol to capture image data that can then be used to generate higher fidelity models. The testing conducted by Object Raku Technology indicates that captured imagery can be easily imported to Sextant, dramatically increasing the realism of the model.[148]

In 2003, the Canadian Department of National Defence (DND) contracted Object Raku Technology to create a basic 3D model of a notional urban training site in Wainwright, Alberta. Additionally, GPS referenced video was taken of the entire Camp Wainwright for the purpose of creating a sample virtual model for testing. This work is on hold at present, but will be re-started when the CMTC is fully established.[149] The Sextant VWT and MRC, enhanced by Red Hen GPS referenced video imagery, has great potential for possible integration into a Canadian urban operations training capability. Such a system

[148] Douglas H. Kliman and Mike Parlow, "GPS Referenced Video for 3D Modeling," (Object Raku Technology Inc. white paper, 26 February 2003).

[149] From 2001-2004, the author was the Directorate of Land Requirements Project Director for the WES project and was responsible for contracting Object Raku Technology for the purpose of identifying requirements for an urban operations training system that could be seamlessly integrated with the WES system in Wainwright.

could be used for garrison training, planning and rehearsal at the CMTC, and for in-theatre mission planning and rehearsal.

NGRAIN Corporation of Vancouver, British Columbia, has invented revolutionary 3D modeling software to create extremely high fidelity information rich 3D Knowledge Objects (3KO) that are highly interactive, physically accurate and have broad deployability. A 3KO is a 3D digital model or scene that contains and visually communicates knowledge about the real object it represents. 3KOs are portable, reuseable, accessible and scalable.[150]

In 2002 and 2004, the Canadian DND contracted NGRAIN to create 3D urban objects as well as a 3D urban training village editor. The prototype editor software is intended to be a synthetic environment based acquisition (SEBA) tool with a rapid prototyping and cost estimating capability to help in the development of a potential urban training site capability. The tool is intended to be used throughout the acquisition process and then be converted to a virtual reality simulator, and potentially integrated with the Sextant VWT and MRC.[151] NGRAIN 3KOs have the potential to exponentially increase knowledge of urban terrain, including the humans who are resident in urban terrain.

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[150] Roger Powley and Josie Simpson, "The Effective Use of Interactive 3D Knowledge Objects in Instructional Programs," (NGRAIN Corporation white paper, September 2004), 3.

[151] Don Durand and Major G.J. Burton, *Statement of Work for: Concept Development – 3D Urban Operations Training Village PRJ-DND-0002-1 Version 4.0*. (Vancouver: i3Dimensions Inc., 19 July 2002).

As can be seen, there are interesting virtual technologies that are either in development or in service. There are also a number of live simulation urban training capabilities that are available commercially. Two of these will be illustrated here.

Cubic Defense Applications Inc., of San Diego, California, is the contractor for the Canadian WES project. At the request of the WES Project Director,[152] Cubic provided a technology overview of basic urban operations training system instrumentation and targetry control systems.[153] Cubic has experience delivering similar systems to the U.S. and British armies for their urban training sites. Typical urban training sites include control facility infrastructure, command of building devices, targetry engagement systems, and battlefield effects systems.

Control facilities contain an integrated management system for capturing all training engagement and imagery data. This data is then processed for use in the after action review system. Still and video imagery collection is done by interior and exterior high and low resolution thermal cameras, and is augmented with an audio capturing system.

Command of building functions is done via a command computer resident in each building that is connected to the control facility. There are a number of discrete devices inside the buildings used to control activity. There are panic buttons to signal the control facility of problems and to unlock doors and windows. There are motion detectors to

[152] The author was the WES Project Director from 2001-2004 and is intimately familiar with all the technologies mentioned in this section.

[153] Cubic Defense Applications, Inc., "Basic Urban Operations Training System Instrumentation and Targetry Control System Technology Overview," Cubic Defense Applications, Inc. white paper. (San Diego, California: 5 August 2003).

trigger the activation of cameras, as well as automatic door lock controls. Lighting can also be controlled, and includes infrared total darkness illumination to save soldiers night vision. Targetry, if employed in the site, is also activated from the control facility under observation via the camera system.[154]

Live simulation engagements in urban settings require a system to track soldiers' locations as they move inside and outside buildings. Location and time data is normally collected via GPS located on each soldier. GPS is ineffective when the satellite signals are screened by buildings, therefore an alternate system of determining location and time must be incorporated. An ultra-wideband (UWB) precision tracking system is used for this purpose. UWB transmitters mounted on the soldiers transmit signals to building sensors which are in turn converted to location points by the building computer. This is particularly important for engagements that occur from outside to the inside, for example a tank gun firing through the wall. The flight path coordinates of the simulated tank round is used to calculate which room in the building will be hit. Then, any soldier in that room at the appointed moment of impact would receive a signal from the building command computer notifying of the engagement.[155]

Finally, there is a battlefield effects system that adds stressful realism to the training. Elements of the battlefield effects system include concussion wave cannons, rooftop explosion devices, 'smells of war' generators, and smoke generators.[156]

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[154] *Ibid*.
[155] *Ibid*.
[156] *Ibid*.

The last technology to be illustrated has already been mentioned earlier. Anteon Corporation of Fairfax, Virginia, has recently developed a mobile, reconfigurable MOUT training facility. The mobile MOUT system is based on sea container-like trailers that can be easily transported for use in any location, particularly in-theatre. The containers can be linked and configured to resemble any building and they can be instrumented for after action review capability. The system comes with a control facility container for collecting data and delivering the after action review.[157] As already mentioned, the U.S. Army has installed one of these facilities at the airport in Baghdad and another in Afghanistan.

It is clear that virtual and live simulation technology does exist that could satisfy some of the requirements for a Canadian Army urban training capability. The technologies illustrated would be useful for individual and collective dry training. There are other technologies that can satisfy command and staff training requirements as well as individual and collective live fire training. They will not be discussed here.

What is apparent is that implementing any of these technological solutions will not be easy. A variety of technologies are involved, some of which may have to be integrated with the WES system which is now being fielded. Standard packages will have to be designed for Army units and bases where urban training would take place. Significant infrastructure would have to be built and existing infrastructure may have to be

[157] Anteon Corporation, "Military Operations on Urban Terrain (MOUT) – Anteon's Mobile Reconfigurable MOUT Training Facility – Mobile MOUT," Marketing package to Canadian Forces Attaché in Washington. (Fairfax, Virginia: Anteon Corporation, 21 July 2003).

redesigned. And of course, it will require funding. Despite the ominous signs, delivering an urban training capability is not an impossible task.

The Army's current short term plan for developing urban training sites is very flawed, and only has the potential to deliver an unsustainable partial collective training capability, as well as to waste staff effort and scarce funding resources. By all means, a study should be undertaken to identify areas on bases where urban training capabilities can be built. However, the only logical path to delivering an all encompassing urban training capability is to create a capital project that has the technical and project management expertise to be successful. Only by maintaining central control of requirements and funding will it be possible to maximize the benefits of standardization across the Army and be cost effective. Additionally, sustaining an Army–wide, high-tech training system will require central funding and control. It is therefore proposed that the Army take immediate steps to include an urban operations training capability in the SCIP, assign funds for its procurement, and create a capital project to deliver the capability.

6. Conclusion

This research paper set out to justify the need for an urban operations training capability for the Army. As background, urban operations were defined and described. Examples of urban operations undertaken by Canadian land forces were used to underscore the relevance and importance of such operations. Findings of the Urban Operations Working Group were used to illustrate the existence of a training capability deficiency.

The paper then provided a report on where the Army is today in turning the focus away from open terrain operations towards urban operations. The hierarchy of policy and doctrine was examined, particularly the positive steps taken since 2002 towards optimizing for urban or complex terrain operations. Examples of local initiatives were used to highlight the extent to which commanders go to provide their soldiers with the best possible urban training opportunities. The need for a centrally standardized and funded training capability then became clear.

Having established the need for an urban operations training capability, the paper then determined where the Army must be by deducing key requirements. Interesting lessons learned from some unusual sources were examined. Since Canada is not alone in its need for an urban training capability, some allied initiatives were provided as food for thought. The key training requirements include urban operations standards, knowledge, training system and realism.

Finally, the paper investigated a path down which the Army can proceed. Some current and emerging technologies were illustrated as potentially suitable for delivering effective urban operations training. In order for the Army to achieve its desired end state of establishing an effective urban operations training capability, a capital project was proposed.

Urban terrain is very complex, consisting of physical, electromagnetic and human dimensions. The physical dimension includes man-made structures and infrastructure

that have height and depth on the surface, sub-surface and above surface. These structures affect the performance of the sensors, weapons and equipment of modern military forces. The electromagnetic dimension exists in the infrastructure and may be useful to all parties operating in the urban terrain. The human dimension includes non-combatants who are innocent, but who may also help or hinder urban operations. Additionally, the human dimension includes diversity, politics and economics that must be well understood by those operating in the environment.

Military operations are also complex and when superimposed on the dimensions of urban terrain, will require officers and soldiers to have special knowledge and training. Allies and intellectuals agree that urbanization in the world is irreversible, and in future, modern militaries will almost always find themselves operating against irregular forces in urban terrain. The Canadian Army has participated in numerous urban operations for the last sixty years, but has had virtually no urban operations doctrine, training or equipment. These deficiencies were confirmed by the Urban Operations Working Group and are supported by intellectual assessment. This conclusively indicates that Canadian land forces will have to operate in complex urban terrain in the future. In order to do so, officers and soldiers must have knowledge of the complexity of urban terrain, as well as the training to operate in it.

The Government of Canada understands the complexity and importance of urban operations. The National Security Policy, the International Policy Statement and the Defence Policy Statement are replete with acknowledgements to that end. The policy

between documents is well linked and the direction to the Canadian Forces contained therein, includes roles, missions and both assigned and implied tasks. There is now a concrete policy base at Government and Department levels from which the Canadian Army is justified in developing doctrine and training capability for urban operations.

The Army is taking steps to develop appropriate doctrine. The Army Strategy and Force Employment Concept documents spell out plans to transform the focus to urban operations. The key elements of transformation are leveraging technological advances, remaining strategically relevant and tactically decisive on the future battlefield, and focusing investment in quantum leap improvements.

At present, LFDTS has been directed to seek funding and proceed in developing standardized Urban Warfare Training sites for the Army as a training development initiative. But this approach to developing urban training capability is flawed. It is short term, with virtually no time to develop standards and requirements. It only has the potential to address some aspects of the physical dimension of urban terrain by constructing some buildings and limited infrastructure. It will provide limited elements of live simulation capability by using existing targetry or by using WES, once it is fielded, for close combat engagements. The approach will not leverage new technology at all, particularly simulation technology. Any investment under this approach will not equate to a quantum leap in capability improvement and because of its short sightedness, will likely not have a funded support plan to maintain facilities once they are constructed.

Local initiatives to conduct urban training are indicative of the urge within the Army to reorient towards operations in urban terrain. They also point out that air and aviation forces also have a role to play in urban operations. Although local initiatives provide exciting training experiences, there is no commonality from one activity to the next, and each activity requires a significant effort to plan and conduct. The excellent skills learned during these activities fade soon afterwards without an ability to conduct continuation training. Although some training opportunities exist at American bases, the cost and effort to travel to the United States is significant and such opportunities are dependant on the facilities being available. Simulation technology greatly improves training realism, but it is costly, and individual units cannot reasonably be expected to procure and sustain their own. Intentions are honourable, but amount to nothing unless properly coordinated and funded. The evidence is clear that the Canadian Army has a deficiency in urban operations training capability. The requirement for such a training capability is also clear.

Canada is responsible for training its own soldiers. The goal is to seek quantum leap improvement in performance on domestic and international urban operations that results in mission success and a safe return home. Standards for urban training and readiness must be objective, and if not, clear standards for subjective rating must be developed. Participation in urban training must include all Regular and Reserve soldiers and officers, in all branches and corps, with no exceptions. Joint urban training, particularly with air and aviation forces, is also a critical requirement. Standards of urban training capability

must be the same in all locations across Canada. Standards are policy oriented and can be implemented quickly with minimal cost.

Knowledge resident in doctrine is the foundation from which soldier and leader knowledge is developed. To maintain its urban operations knowledge the Army must participate actively in all allied urban operations forums. Canada must consider adopting US urban operations doctrine or making it required reading for officers. Domestic and international information packages, including cultural awareness, must be developed and studied in preparation for deployment. Rules of engagement, construction techniques, urban engineering and weapon effects must be taught to and studied by all soldiers. Development of urban operations knowledge is a long term investment that must be coordinated and funded.

An urban operations training system is required to provide the conditions for developing improved performance. The system must include individual, collective and command and staff training capability. Virtual, live and constructive simulation must be exploited. The Army requires urban training capability at home and in-theatre. Facilities such as urban training sites and live fire ranges are required. They must be standardized and interoperable with each other, and to the greatest extent possible, simulation capability must be embedded in operational systems. An urban operations training system represents a significant, long term investment in technology, infrastructure and life cycle support. If centrally coordinated and funded, maximum capability could be procured for the best cost.

Urban realism is the critical enabler that will energize the standards, knowledge and training system. Replication of the complexity of urban terrain will help inoculate against stress as well as elevate skills like fitness, movement and shooting to higher limits. The introduction of civilian authorities, non-governmental organizations, and refugees and displaced persons to training will improve negotiation, target discrimination, and rules of engagement skills. Investing in realism will add significant value to standards, knowledge and the training system. The costs for realism would be included as factors of each of those capability areas.

Virtual and live simulation technology does exist that could satisfy some of the requirements for a Canadian Army urban training capability. These technologies would be useful for individual and collective dry training. There are other technologies that can satisfy command and staff training requirements as well as individual and collective live fire training.

Finally, delivering an urban training capability is not an impossible task. Central control of requirements and funding would make it possible to maximize the benefits of standardization across the Army and sustain such a high-tech training system, all while being cost effective. The only logical path to delivering an all encompassing urban training capability is to create a joint capital project team that has funding and the technical and project management expertise to be successful. It is therefore proposed that the Army take immediate steps to include an urban operations training capability in the

SCIP, assign funds for its procurement, and create such a capital project to deliver the capability. The Canadian Army needs to invest in an effective urban operations training capability if it is to be strategically relevant and tactically decisive on future domestic and international urban operations.

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