

# **Canadian Land Forces 21 (CLF 21): A Multi-Purpose Force for the Next Century**

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## **The Current Predicament**

The government of Canada committed itself, in the 1994 Defence White Paper, to "maintain a multi-purpose, combat-capable force" so that "Canada will retain the capability to make a significant and responsible contribution to international peace and stability, within a UN framework, through NATO, or in coalitions of like-minded countries" (DND 1994, 38). The White Paper also indicates that "Canada needs armed forces that are able to operate with the modern forces maintained by our allies and like-minded nations against a capable opponent -- that is, able to fight 'alongside the best, against the best'" (DND 1994, 14). The problem with this commitment is that the government hopes that it will not have to honour it; if it did, Canadians would learn -- if they are not yet aware of -- that our armed forces, and in particular the Land Forces, are not prepared to fight alongside the best, against the best. The Gulf War of 1991 showed that Canada could commit naval and air units capable of operating on a par with the best in a relatively low threat environment (given the Coalition's complete air superiority and control of the sea). But, Canadian land forces during that war were left to man perimeter defences around the airbase in Qatar and the Canadian headquarters in Bahrain, and to provide a field hospital and signal services; in short they were kept away from the ground war.

Canada might well have entered what Edward Luttwak (1996) calls the "post-heroic" age, in which Western democracies can no longer entertain the thought of committing ground troops to the risk of battle, but as events showed in the former Yugoslavia for the Canadians (the Medak Pocket Operation in 1993) and in Somalia for the Americans, even peacekeeping can lead to some nasty ground combat. Western democracies might try hard at developing air power for peace keeping and peace enforcement (as shown in the last stage of Bosnia's civil war and the recent crisis in Kosovo), but the requirement for combat-capable ground forces remains for deterrence, warfighting and peace support operations.

Unfortunately, the combat capabilities of our ground forces are limited and that restrains the range of tasks they can assume with acceptable risks as the Land Forces are acutely aware (Coulon 1998). The Land Forces have acquired recently up-to-date APCs/IFVs (the LAV III) as well as a sophisticated recce vehicle (the Coyote), but they still remain without any credible direct fire support vehicle or main battle tank (MBT). Their artillery support is limited in the calibre of mortars (81mm) and the variety of artillery systems (light 105mm howitzers, and 155mm howitzers). Finally, their mechanized units operate a variety of tracked and wheeled vehicles, a condition that does not ease combined arms and logistics. This would have been enough to complicate the participation of Canadian ground forces in the Gulf in 1991. But since then the problem has worsened as some of our close allies, namely the United States and Great Britain have kept modernizing their forces, thus widening the capability gap that separates us from them.

Much of the military modernization drive in those countries is informed by the notion that we are facing a Revolution in Military Affairs (RMA) characterized by the integration of information technologies in weapon systems, military organizations and operations. When information technologies are integrated into a coherent system, and linked to modern weapon systems operated by highly trained personnel, they provide force multipliers to military units, allowing them to perform more complex manoeuvres, to fire accurately at longer range and to experience a higher degree of situational awareness compared to an opponent that would not benefit from these technologies. Ground units with integrated advanced information technologies are called "digital". In a military exercise held in November 1997 a digital formation (the US 4th Infantry Division) showed that "[c]ompared with currently deployed forces, the digitized 4ID inflicted more than twice as many enemy casualties, in half the time, over three times the normal battlespace, using 25 per cent fewer combat platforms" (Hewish 1998).

The RMA presents both challenges and opportunities to the Canadian Forces (CF). The RMA aggravates the pressure on the acquisition budget by adding a new series of costly acquisition requirements in terms of information systems on top of the need for new weapon systems, or the modernization of current ones. In addition, the integration of information technologies with weapon systems into military units will require more resources for reorganization and training. On the other hand, the RMA might well be the only way to get increased efficiency from the smaller armed forces planned since the end of the Cold War. In a Canadian defence context characterized by severe budgetary constraints and the requirement to field ground units sophisticated enough to operate smoothly with American, British, or other NATO armies, the RMA can only be afforded if we trade the heavy equipment/force structure inherited from the Second World War and Cold War eras for the improved performances generated by information systems and smart munitions integrated in a lighter force structure. The resulting units, although they would not qualify as heavy mechanized, could have more firepower and fight more smartly than what we have, or what we could afford if we attempted to reproduce the current force structure with up-to-date heavy armoured equipment like the latest NATO MBTs, tracked infantry fighting vehicles (IFVs) and self-propelled guns (SPGs). I call this new force structure the Canadian Land Forces 21 (CLF 21).

### **The CLF 21 Model. A Quick Comparison with the Current Force Structure**

The Canadian Land Forces 21 (CLF 21) takes the structure of a current Canadian mechanized brigade group as the starting point to develop an alternative force structure that could be deployed either as a brigade, something likely in a major regional conflict, or in self-contained combined arms battle groups, a more likely occurrence in multilateral peacekeeping operations, or in scenarios involving a quick deployment over strategic distances. The alternative force structure envisaged in CLF 21 (see Figure 1) is characterized notably by: (a) the creation of three permanent combined arms battle groups (CABGs), (b) the absence of an armoured regiment and its MBTs, and (c) the creation of an airmobile battle group. Further reorganization of the current structure would be necessary to adapt support units and the command structure to the requirements of CLF 21. As presented here the CLF 21 model remains an intellectual exercise designed to stimulate thinking and debates within the Canadian defence community rather than a foolproof and detailed policy plan. I am convinced that the trends in force structure identified here are the good ones, but I cannot say that all the details are definitive. Further research (including war-gaming) would be required to validate the concept.

In terms of major weapon systems and equipment, the comparison between the two brigade structures can be summarized in Table 1.

As Table 1 shows the CLF 21 equipment pool features increased artillery assets compared with the current force. In connection with improved reconnaissance assets (including 22 UAVs) and the procurement of smart munitions for the 120mm mortars, 155mm howitzers and multiple launch rocket systems (MLRS), the new brigade would field much more effective indirect firepower than the current brigade. The equipment pool is also characterized by a standardization of weapon platforms on wheeled chassis in order to provide a common degree of tactical and operational mobility to the various elements of the force as well as to ease the logistical burden. To the extent feasible, the platforms should even be standardized on a common chassis, like the LAV family manufactured by the Diesel Division of General Motors of Canada.

The new force structure does away with MBTs on the grounds that Canada cannot afford the latest MBTs as well as the other AFVs that are part of the heavy mechanized combined arms team, and that such heavy armour is not particularly relevant to the most likely deployment scenarios for Canadian ground forces; which are the lower end of the conflict spectrum in terms of the military technological sophistication of likely opponents with some peak scenarios involving second-tier military opponents like the armed forces of Iraq, North Korea or of the Yugoslav Republic. Those who believe that only an MBT can provide an effective antitank response would have to learn to achieve the same result through the application of the principles of combined arms, defeating the armour threat through the synergistic effects of direct fire from an armoured combat vehicle (ACV), smart munitions delivered by artillery or planes, and

**Table 1: Summary of Major Weapon Systems and Equipment**

| Current CMBG         | CLF 21 CMBG                 |
|----------------------|-----------------------------|
| 78 MBTs (Leopard C1) | 70 ACVs (ex: LAV III 105mm) |

|  |  |
|--|--|
| 219 APCs/IFVs<br>(included here only those in the 3 infantry battalions) | 147 APCs/IFVs (LAV III)<br>(included here only those in the 3 infantry battalions) |
| 67 recce AFVs (Coyote)   | 34 recce AFVs (Coyote)   |
| 24 155mm SPGs (M109)   | 16 155mm SPGs (ex: Denel G6)   |
| 24 81mm mortars (on M113 or Bison)                                       | 8 MLRS (ex: HIMARS)  |
| 36 TOW Under Armor (M113)  | 36 120mm mortars (on LAV III or Bison)   |
| 12 ADATS   | 36 TOW Under Armor (LAV III)   |
| 24 transport helicos (Griffon)   | 12 ADATS   |
|  | 85-100 transport helicos (Griffon)   |
|  | 12 recon/attack helicos<br>(Ex: A129 or RAH-66)                                    |
|  | 20 tactical UAVs   |
|  | 2 operational UAVs   |
| <b>summary of firepower</b>  | <b>summary of firepower</b>  |
| 150 antiarmour systems*  | 190 antiarmour systems*  |
| 48 artillery systems ( $\geq$ 81mm)                                      | 60 artillery systems ( $\geq$ 120mm)   |
| 24 antiarmour capable artillery systems                                  | 60 antiarmour capable artillery systems  |

\* Antiarmour systems include the 12 ADATS, although these are primarily air defence systems, as well as the artillery systems with a calibre allowing the firing of antiarmour smart munitions ( $\geq$  120mm). In addition to the totals above, some 200 short and medium range antiarmour weapon systems are part of the equipment of infantry companies in both force structures.

antitank missiles fired from ground or air platforms. The number of antiarmour systems in CLF 21 reflects the fact that the antiarmour role will be assumed by a greater variety of weapons in the future, and that, although confronting a tank-equipped force is not the most likely scenario, it may be the most demanding one for a light mechanized force, and consequently requires significant antiarmour assets. Finally, many antiarmour systems are versatile weapons, which can also be used against bunkers, fortified buildings, or major pieces of equipment.

The equipment list for the CLF 21, as any traditional list of equipment shows mainly weapon systems, it does not include the key information systems and technologies that would give such a force the benefits of the RMA. Unmanned aerial vehicles and other reconnaissance platforms

need to be connected in real-time to the command elements of all units as well as to those planning and directing indirect fire, vehicles need up-to-date navigation instruments and vision equipment to locate themselves and others with precision, to operate in more dispersed formation over an obscured battlefield, and at night or in adverse weather conditions. All vehicles, and maybe even some foot soldiers in a subsequent phase of digitization, will be integrated into a common communication system, and tactical and operational battle management systems. Fortunately, digitization and information warfare are the RMA-related issues that have been paid most attention by the CF so far. With the introduction of such systems a light mechanized force structure like CLF 21 would have a degree of situational awareness sufficient to maintain dominant manoeuvre over heavier but "dumber" and less agile opponents.

## **A Detailed Look at the Main Components of the CLF 21 Brigade**

A more comprehensive review of the main components of the CLF 21 brigade is necessary to understand the extent of the changes envisaged by this scheme. More specifically, the CLF 21 brigade is characterized by three permanent combined arms battle groups, a reconfigured field artillery regiment, a diversified reconnaissance group, and the presence of an airmobile battle group.

### **The Combined Arms Battle Group**

One could argue that the history of tactics during the 20th century has been characterized by the attempt to master combined arms, and by the integration of combined arms at an increasingly smaller unit level (House 1984). Combined arms advocates argue "that different arms and weapons systems must be used in concert to maximize the survival and combat effectiveness of each other" (House 1984, 2). Combined arms theory builds upon the principle of synergy: the effect of combined arms is greater than the cumulative effects of each arm taken individually (Armstrong 1985, 170; Leonhard 1994, 94). In the CLF 21 model, combined arms are integrated down to the battle-group level (see Figure 2), essentially a mechanized infantry battalion reinforced with armour, artillery (120mm mortars), antitank, and reconnaissance assets. To my knowledge the Canadian army lacks a formal table of organization and equipment for its battle groups, these are adhoc formations created for a specific mission. In my opinion the level of training and the skills needed to implement combined arms at the tactical unit level require a permanent unit structure where all contributing arms can learn, train and work together; thus the creation of three combined arms battle groups (CABGs) per brigade. The CABG also offers a "pre-packaged" combined arms team of the right size for most multinational peacekeeping missions, or as the Canadian contribution to a multinational rapid reaction force.

The CABG also features a smaller mechanized infantry battalion, made up of only three companies instead of the current four. This change releases three infantry companies for the whole brigade that are reaffected as light infantry in the airmobile battle group. The smaller infantry battalions are supported by a wider and more powerful range of weapons and reconnaissance means than what is available to the current four-company infantry battalion, and this should compensate for the fewer infantry deployed in combat. For missions that are more personnel-intensive (like military operations on urban terrain), the force would have to rely on additional infantry from the airmobile group. The transition to three-company battalion also

corresponds to a recent trend found in the US Army (Benson 1997; Steele 1998). With improvements in information technologies, conventional weapons (firepower and range) and mobility, a larger area can be controlled by a given unit than previously; in consequence, tasks previously assigned to divisions, can be assumed by brigades, and similarly for brigades, or regiments, and battalions; what were considered tactical units can now assume operational-level tasks (Bellamy 1987, 275, 298-99; Macgregor 1993, 41-42).

## **The Field Artillery Regiment**

Increased digitization of the battlefield, additional means of reconnaissance like unmanned aerial vehicles (UAVs), and the availability of a greater range of smart munitions for artillery systems indicate a renaissance of artillery and long-range indirect fire. Artillery systems are no longer limited to the suppression (and random destruction) of enemy defences, they can increasingly destroy specific targets even when the latter are mobile or armoured. The CLF 21 field artillery regiment (see Figure 3) takes into account these developments to produce leaner, but more powerful artillery support at the brigade level. The CLF 21 four howitzer batteries, each count only four 155mm SPGs instead of six as currently; the whole regiment has therefore only sixteen 155mm SPGs instead of twenty-four. However, the regiment would get in the new scheme two MLRS batteries for a total of eight MLRS vehicles. These two MLRS batteries would more than compensate for the missing eight 155mm SPGs. In order to give a comparable degree of mobility to the various components of the brigade I recommend that the next 155mm SPG procured by Canada be mounted on a wheeled chassis like the South African G6 SPG. The same rationale should apply to the procurement of the MLRS, it should be on a wheeled platform like the US HIMARS. Finally, the field artillery regiment has its own UAV platoon in order to have an autonomous forward observer capability.

## **The Reconnaissance Group**

Reconnaissance (recce or recon for short) is an essential function in the CLF 21 model (see Figure 4). A light mechanized force needs excellent recce to survive on the battlefield. In addition, many information technologies included in the RMA translate into increased means for conducting recce. Accordingly, the CLF 21 model allocates significant recce assets to all the components of the force: the CABGs have their own Coyote recce AFVs and UAVs, the field artillery regiment also has its own UAVs, and the airmobile battlegroup has an armed reconnaissance helicopter flight. The Recce group, on the other hand, represents the reconnaissance assets for the whole brigade and its command. In the current force structure the reconnaissance task is carried out by a recce squadron made up of 22 Coyote recce AFVs. I found this concentration of all recce assets on a single platform to be problematic. Different recce platforms would provide information in a broader variety of situations. I therefore recommend that the CLF 21 recce group include, besides two Coyote troops, a troop of ACVs for situation where one has to fight to get information; a light recce platoon made up of infantry on light wheeled vehicles for cases where stealthiness and human presence are required; and a reinforced UAV platoon made up of four tactical (short-range) machines and two operational machines with a longer range and endurance for the broader reconnaissance needs of the brigade headquarters.

## **The Airmobile Battle Group**

The CLF 21 model introduces an airmobile battle group (AMBG) (see Figure 5) into the brigade structure where the current brigade has only a tactical transport helicopter squadron of 24 CH-146 Griffon. The AMBG, or its components, can fulfill the following tasks in support of the brigade, or one of its CABG: (a) air reconnaissance, (b) close-air support, or (c) additional (heliborne) infantry. Airmobile units have shown their usefulness in many low-intensity conflicts, and since the 1980s they have been integrated even in high-intensity conventional war planning as a means of achieving a higher degree of mobility and manoeuvre against ground units (Allen 1993; Dempsey 1994; Simpkin 1985, 117-132). The implementation of the AMBG portion of the CLF model requires the most serious study considering the costs involved in the acquisition of even a small fleet of dedicated armed recon helicopters, like the Agusta A129 or the yet to be fielded Boeing/Sikorsky RAH-66 Comanche, and in the expansion of the tactical transport helicopter fleet. The AMBG is not large enough to operate autonomously in most middle to high-intensity combat scenarios, it would be tied to a CABG or the whole brigade instead, thus limiting some of its airmobile potential. As a result, the advantages of the AMBG have to be weighted against its disadvantages in the context of likely scenarios for its use so as to determine if it is a cost-efficient addition to the CLF 21 model. Consequently, the AMBG would be the last phase of the model to be implemented. In terms of equipment procurement, the AMBG concept would be an important contribution of the Air Force to the CLF 21 model; in addition to the support combat and transport aircraft can lend to the ground force. The closer integration of CF air and ground units in the future would converge with similar efforts abroad to develop joint operations and units.

## **The Joint Aspects of CLF 21**

As just mentioned "jointness" is a feature that armed forces are increasingly seeking. The concept has a peculiar US ring, and it is obvious that the CF cannot envisage within their modest means the joint warfare operations envisaged by the US armed forces. The meaning of jointness in a Canadian context will be necessarily scaled down. In the CLF 21 scheme it refers essentially to the contributions of the Air Force and Navy to the logistics of an expeditionary force and the contribution of the Air Force to the AMBG, and to other tasks in support of ground forces (air superiority, interdiction, and close-air support). In that perspective the current modernization plan for the CF-18 seems appropriate, as well as the procurement of additional tactical transport helicopters and of a C<sup>3</sup>I system compatible with the Army and Navy (Hobson 1998b). But, there is still a requirement for an upgrade or replacement for the C-130 transport aircraft and it is necessary that the Air Force fully develops a capability to deliver precision-guided munitions in support of ground forces.

With the end of the Cold War, Canada and the United States can no longer rely on forward-deployed units, or pre-positioned matériel, to carry out most of their interventions abroad. Increasingly, North American powers have to face the challenge of projecting military power over strategic distances and have to restructure their forces in consequence. The main contribution of the Navy to the CLF 21 scheme would be to carry, supply, and support CLF 21 units in deployment abroad when sea logistics and support are feasible. The Canadian Navy could contribute to the CLF 21 scheme by realizing the Afloat Logistics and Sealift Capability

(ALSC) project mentioned in the Defence Planning Guidance 1997 (DND 1997, 2-12; Irvine 1997).

## **The Pros and Cons of CLF 21**

As any policy option the CLF 21 model has its advantages and limitations or weaknesses. The following six points summarize the pros and cons of CLF 21.

### **The Main Advantages of the CLF 21 scheme**

#### ***Increased Strategic and Operational Mobility***

Rapid deployability and strategic mobility are key requirements in the current strategic environment for Canada, since we have forces based in North America, but most likely to be deployed out of the continent, a condition that contrasts with the situation during the Cold War when a greater proportion of our armed forces was forward-deployed in Europe with a series of logistical facilities in-theatre. The requirement for rapid deployment over intercontinental distance in theatres of operations with little logistical facilities increases the strategic value of light forces for a North American power with international commitments like Canada. A light force can be more easily deployed over long distance than a heavy force since it requires less air or sea cargo space.

Light mechanized forces also have a greater mobility once deployed in-theatre compared with heavy mechanized forces that require heavy tank transporters and considerable amounts of petrol, lubricants, and maintenance to keep moving; wheeled vehicles can move faster and with less fuel and maintenance than tracked vehicles. This mobility is a key advantage of a light mechanized force from the standpoint of a strategist looking at operational art. A light mechanized force can compensate its decreased "mass" by the greater "velocity" of its manoeuvres (Leonhard 1994, 84-85).

#### ***Affordability***

Light mechanized forces are cheaper to acquire and maintain than heavy mechanized forces. Most wheeled armoured vehicles are less sophisticated machines than a modern main battle tank or tracked infantry fighting vehicle; although some of the specific vehicles mentioned in this study like the Italian Centauro tank destroyer or the South African G6 self-propelled howitzer probably approach the cost and sophistication of equivalent tracked vehicles. In addition, as mentioned in the previous point, since wheeled vehicles represent a lesser logistical burden they are also cheaper to operate and maintain. Although this is not a key argument presented here in favour of the CLF 21 structure, one should also mention that this force would have a greater degree of compatibility with Canada's defence industrial base than a force based on heavy armoured vehicles, since we already have a major wheeled AFV producer in Canada as well as a major (civilian) helicopter manufacturer. The skills and training for operating, and maintaining heavy wheeled vehicles and helicopters would also benefit in terms of personnel recruitment and training from similar trades and skills in the civilian economy.

## ***Flexibility***

Post Cold War military deployments have often been made in the context of peacekeeping operations, or operations other than war (OOTW); in many instances these operations take place in areas with constricted terrain and/or concentration of civilian population. These operational parameters are almost the antithesis of what heavy mechanized forces have been designed for, i.e., war operations in open country. Heavy mechanized forces are short of dismounted infantry for peacekeeping operations, and forego much of their intrinsic value when deployed in constricted terrain like hilly, wooded or built-up areas. For similar defence outlays a light force structure would allow the fielding of more infantry for operations in constricted terrain or in densely populated areas. However, the CLF 21 structure has enough capabilities to be more than just a peacekeeping force. Its mobility and firepower make it a valuable force for a range of military operations in the framework of war operations. In a conventional war a light mechanized force can undertake both offensive operations, like a deep penetration in the enemy's rear areas, or the screening of a main offensive; and defensive operations, acting as a theatre-covering force, as a counterstrike reserve, or assuming rear-area security tasks. The CLF 21 structure thus provide a multi-purpose military instrument more flexible than a heavier mechanized force.

## **Main Shortcomings of the CLF 21 scheme**

### ***The issue of Vulnerability (Protection and Firepower)***

Light forces are perceived as more vulnerable tactically than heavy forces since they carry less protection and firepower. This disadvantage is a consequence of the trade-off that brings greater operational and strategic mobility. The traditional response to this deficiency has been to use these forces in scenarios that exploit their strength and downplay their vulnerability. Thus, light forces like commandos or paratroopers are expected to operate with the benefit of surprise and against rear-area enemy units of lower quality; when they do not, failure can result as when the British 1st Airborne Division landed near German heavy units at Arnhem in September 1944. Therefore, the commitment of a light force in high-intensity war operations must be well-thought-out.

The CLF 21 model relies largely on light armour. Even the best-protected light armoured vehicles have limited armour protection, they can withstand bullets and shrapnel on all aspects as well as light cannon (20-30mm) fire over their frontal arc, and they offer better protection than light tracked vehicles (like a M113 APC, for instance) against landmines; finally, all light armour is vulnerable to the shaped charge of light antitank rocket launchers, and of heavier antitank missiles. The argument could be made that this level of protection is insufficient. Unfortunately, it is shared by most troop-carrying IFVs and APCs in the world. Only the latest Western MBTs offer a significant degree of protection against antiarmour weapons and the option of offering the same protection to the other elements of the combined arms team has never been seriously considered for reasons of costs. Thus, in terms of armour protection, the CLF 21 structure does not reduce significantly the armour protection currently afforded by the mechanized infantry, reconnaissance and artillery; the only real difference in armour protection is the replacement of the MBT by an ACV as a direct fire support vehicle. The ACV does not offer obviously the same level of protection than an MBT, and cannot be used tactically in the same way.

Armour design might well reach soon a fundamental reconceptualization. If current trends continue toward bigger high-velocity guns (from a standard of 105mm NATO armies moved to the current 120mm calibre and are now considering a 140mm calibre), more powerful antitank missiles, and top-attack antiarmour smart munitions the weight of armour required to protect the next generation of MBTs would risk limiting dramatically their tactical and strategic mobility. Thus, next-generation tank designs seek smaller vehicles that will rely on stealth and active defences rather than on the sheer weight of armour to survive on the battlefield (Ogorkiewicz 1997, 33, 36 and 40). The gulf between heavy and light armour forces in terms of protection is not as great as it appears, and might well decrease in the future as all AFVs will increasingly rely on other measures than armour for protection.

The gap in terms of firepower between light and heavy armoured forces is also less dramatic than what one might assume. Wheeled AFV designs have made significant progress in the size of guns that can be carried by these light armoured vehicles. The French AMX-10RC reconnaissance vehicle and the Italian Centauro B1 tank destroyer carry a 105mm gun (the same calibre carried currently by the Canadian C1 Leopard tank), while the South African 155mm G6 self-propelled howitzer is mounted on a six-wheeled chassis. However, the narrow issue of the size of the guns carried by light armour would risk missing the larger point that CLF 21 units would respond to an armour threat not through one-on-one gun duels, but rather through a combined arms response where the armour threat would be faced by smart antiarmour artillery munitions, antitank missiles fired from the ground and from helicopters (or in the future from UAVs), and with a measure of close air support. In summary, the issue of the vulnerability of light armour in comparison to heavy armour can easily be exaggerated. Except for the latest MBTs, all AFVs share a common degree of vulnerability to a variety of antiarmour weapons, and future armour design might well erode the divide between heavy and light armour.

### ***The Challenge of Implementation***

Implementing the CLF 21 model even under auspicious financial conditions, which is not the case, will pose a significant challenge to the Land Forces. The integration of information technologies into military units will require additional skills from soldiers. The digitization revolution will also affect the command structure. Headquarters will have to be modified to take into account the new force structure made up of smaller, combined arms, manoeuvre units (the CABGs), and the greater importance of information systems and operations. NCOs, junior and middle-rank officers will see their responsibilities increased as the key to success in military operations shifts to the actions of CABGs. The Land Forces would also have to adapt their doctrine to the new structure and weapon systems included in the CLF 21, a force without MBTs and with combined arms integrated at the level of the battle group. This whole effort will require additional resources for unit training and officer professional development.

### ***Transition Costs***

Although CLF 21 might be cheaper, and more effective, in terms of sustained military power than the current force structure over the long term, it would require in the short-to-medium term significant investments. This is a difficult task for a cash-strapped organization like DND. Therefore, the implementation of the CLF 21 model, or an alternative force modernization plan,

will require from DND and the Defence Minister the political will to make the case to the Government that increased resources for defence are not frivolous spending, but a necessity to maintain armed forces capable of honouring Canada's international security commitments. Postponing force modernization, as we have done in past decades, is no longer an option.

## References

- Allen, Matthew (1993), *Military Helicopter Doctrines of the Major Powers, 1945-1992* (Westport, CT: Greenwood Press).
- Armstrong, Patrick (1985), "On Combined Arms" in Lt. Col. John A. English, Maj. J. Addicott and Maj. P.J. Kramers (eds), *The Mechanized Battlefield. A Tactical Analysis* (Washington, D.C.: Pergamon-Brassey's), pp. 165-70.
- Bellamy, Chris (1987), *The Future of Land Warfare* (New York: St. Martin's Press).
- Benson, Kevin C.M. Lt. Col. (1997), "The Armor Battalion After Next. A Modest Proposal", *Armor*, vol. 106, no. 5 (September-October), pp. 12-13 and 50.
- Coulon, Jocelyn (1992), *La Dernière Croisade, La Guerre du Golfe et le rôle caché du Canada* (Montréal: Éditions du Méridien).
- Coulon, Jocelyn (1998), "L'armée de terre ne peut se battre «aux côtés des meilleurs»", *Le Devoir*, 21 septembre, p. A4.
- Dempsey, Thomas A. (1994), "On the Wings of the Storm: Heliborne Maneuver during the Gulf War", *Defense Analysis*, vol. 10, no. 2, pp. 165-79.
- Department of National Defence (1994), *1994 Defence White Paper* (Ottawa: Minister of Supply and Services Canada)
- Department of National Defence (1997), *Defence Planning Guidance 1997* (Ottawa: Department of National Defence)
- [\[http://131.137.255.5/vcds/dgsp/dpg/dpg97/index\\_e.html\]](http://131.137.255.5/vcds/dgsp/dpg/dpg97/index_e.html)
- Haydar, C.E. Maj. (1997), "New Equipment for the Infantry", *Infantry Journal*, vol. 32 (winter) [www.brunnet.net/infsc/v32e/neweqpt.htm].
- Hewish, Mark (1998), "US Army marches towards a digital horizon", *International Defense Review*, vol. 31, no.1 (January), p. 11.

Hobson, Sharon (1998a), "Now it's the army's turn. The army plans to spend \$4 billion on new equipment over the next decade", *Ottawa Citizen*, 7 October 1998, [<http://www.ottawacitizen.com/hightech/981007/1919401.html>].

Hobson, Sharon (1998b), "Upgrades in store for air force. Ottawa-area contractors play big roles in improvements", *Ottawa Citizen*, 7 October 1998, [<http://www.ottawacitizen.com/hightech/981007/1919391.html>].

House, Jonathan M. Capt. (1984), *Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization* (Fort Leavenworth, KS: U.S. Army Command and General Staff College, Combat Studies Institute, Research Survey no. 2).

Irvine, Bruce T. Lt-Com. (1997), "Afloat Logistics and Sealift Capability for the Canadian Navy", *Canadian Defence Quarterly*, vol. 26, no. 4 (Summer), pp. 14-19.

JDW (1998), "Athene will put Canadian Army in command", *Jane's Defence Weekly*, vol. 29, no. 9, (4 March), p. 7.

Leonhard, Robert (1994), *The Art of Maneuver. Maneuver-Warfare Theory and AirLand Battle* (Novato, CA: Presidio Press, [1st ed. 1991]).

Luttwak, Edward N. (1996), "A Post-Heroic Military Policy", *Foreign Affairs*, vol. 75, no.4 (July/August), pp. 33-44.

Macgregor, Douglas A. (1993), "Future Battle: The Merging Levels of War", *Parameters*, vol. 22, no.4 (Winter 1992-93), pp. 33-47.

Ogorkiewicz, R. M. (1997), "Transforming the tank. Battle tanks stand at a crossroads of development", *Jane's International Defense Review*, vol. 30, no. 10 (October), pp. 30-43.

Pagé, J. Y. S. D. Capt. (1996), "The Canadian Military Satellite Communications (CMSC) Project" (DND official website: [www.dnd.ca/commelec/vol32/part9.html](http://www.dnd.ca/commelec/vol32/part9.html)).

Pengelly, Rupert (1997), "British Army outlines replacement for Challenger 2", *Jane's International Defense Review*, vol. 30, no. 1 (January), p. 10.

Roos, John G. (1998), "Striking the Best Balance. Army's Top Job Involves Shepherding Today's "Total Army" While Riding Herd Over Tomorrow's Modernization Activities", *Armed Forces Journal International*, vol. 136, no.3 (October), p.46-54.

Simpkin, Richard E. (1985), *Race to the Swift. Thoughts on Twenty-First Century Warfare* (London: Brassey's).

Steele, Dennis (1998), "The Army XXI Heavy Division -- First Blueprint of the Future Army", *Army Magazine*, (July)[<http://www.ansa.org/armyzine/steele98jul.html>].