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Rented Ships and More Jet Airliners: How the Canadian Forces Can Achieve Reach on a Budget

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Abstract

The concept of reach encompasses both strategic deployment and strategic sustainment. The need for the Canadian Forces (CF) to obtain a strategic reach capability has been repeatedly acknowledged and well understood for over a decade. Unfortunately, little has been accomplished to address this capability shortfall due to funding limitations. This need is expected to continue and even increase in response to the challenges presented by the future security environment.

Currently the CF possesses extremely limited organic strategic mobility assets and has misused its tactical mobility assets, specifically its fleet of C-130 Hercules aircraft, to overcome this shortfall. This has caused the premature demise of the Hercules fleet and led to an increasing reliance upon commercial strategic airlift. This reliance upon commercial carriers for strategic airlift is fraught with risk due to their cost, questionable reliability and the potential for the political interference from the carriers home government.

In response to this dependence, the proposal to obtain a fleet of C-17 Globemasters for the CF was examined and rejected due to the massive expense associated with the C-17. A more modest project to replace the ageing fleet of Hercules is currently ongoing. This in itself will be insufficient for the CF to obtain strategic reach. Instead, the purchase of additional commercial pattern jet transport aircraft and the adoption of a hub and spoke concept of operations is required. This will then enable the CF to sustain global deployments.

In order to initially deploy globally, the CF will have to continue to rely upon strategic sea lift. The recent North Atlantic Treaty Organization's (NATO) Multinational

Implementation Arrangement on Strategic Sealift Commitments (MIASSC) will provide the CF with reasonably assured access to strategic sealift. With this in mind, the ongoing Joint Support Ship project's intentions to provide a limited strategic sea lift capability becomes questionable given the opportunity cost associated with the reduction in its ability to perform its primary AOR function while carrying out strategic lift taskings.

Although the CF can continue to rely upon commercial and NATO strategic sea lift assets, it must obtain additional commercial pattern strategic air lift assets, replace its current tactical airlift assets, embrace aspects of the revolution in military affairs and adopt a hub and spoke approach to deployment and sustainment for reasons of cost, utility and reliability, if it is to obtain a global reach capability.

Rented Ships and More Jet Airliners: How the Canadian Forces Can Obtain Reach on a Budget

The Defence White Paper of 1994 lists the three primary tasks for the Canadian Forces as the defence of Canada, the defence of North American in conjunction with the United States and to contribute to international peace and security.[1] The first two tasks have a geographical basis and are more readily grasped and understood. The concepts associated with the defence of Canada and the defence of North America hold little in debate with respect to the terms underlying concepts. The defence of Canada requires the Canadian Forces (CF) to maintain sovereign control over Canadian territory including airspace and territorial waters. The defence of North America is embodied in Canada's participation in North American Aerospace Defence (NORAD) treaty and other bilateral defence and security organizations with the United States. These two policy tenants have appeared consistently since 1964 and can be expected to remain fundamental to Canadian defence policy for the foreseeable future.[2] The third task, to contribute to international peace and security, has also been a consistent element of Canadian defence policy along with the debate as to what is the exact meaning of the phrase.[3] Interpretations of the task have ranged from the ability to participate in high-intensity warfare, through to the ability to deploy lightly armed forces in support of United Nations peacekeeping and observer

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1 Department of National Defence, *1994 Defence White Paper* (Ottawa: Canada Communications Group, 1994).

2 Elinor C. Sloan, *The Revolution in Military Affairs*, (Montreal: McGill-Queen's University Press, 2002), 139.

3 Sloan, *The Revolution in Military Affairs. . .*, 139.

missions.[4] Regardless of where in the spectrum of conflict one expects the CF to contribute to international peace and security, the underlying requirement is that the CF be capable of operating outside of Canada if it is to carryout its third assigned role.

Subsequent documents, specifically *Defence Planning Guidance 2001* (DPG 2001), have reaffirmed the basic tenants of the 1994 White Paper. It does however, acknowledge that there is no direct conventional military threat to Canada and there is a very low risk of a threat emerging in the foreseeable future.[5] DPG 2001 identifies that a fragile international security situation exists in which "numerous issues threaten, or have the potential to threaten, Canada and Canadian interests."[6] To address this threat, DPG 2001 calls for a "modern, combat-capable, multi-purpose and globally deployable Forces."[7] This call for global deployability reiterates statements contained within the strategic direction document *Shaping the Future of The Canadian Forces: A Strategy for 2020* (CF 2020) issued in 1999. From these three documents, it is evident that there is a clear understanding of the requirement for the CF to have the capability of deploying and operating globally if it is to "continue to work for the well-being of Canadians and international peace and security."[8]

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4 "Canada's Foreign Policy: Principles and Priorities for the Future," *Report of the Special Joint Committee of the Senate and the House of Commons, reviewing Canadian Foreign Policy*, (Ottawa: Canada Communications Group, 1994), 13.

5 Department of National Defence, *Defence Planning Guidance 2001* (Ottawa: Canada Communications Group: 2001), paragraph 101 General [journal on-line]; available from http://www.vcds.forces.gc.ca/dgsp/pubs/rep-pub/dfppc/dpg/dpg2001/chap1_e.asp; Internet, accessed on 28 February 2004.

6 *Ibid*, paragraph 105.

7 *Ibid*, paragraph 105. (1).

8 *Ibid*, paragraph 105(3).

To operate globally, a force must not only be capable of deploying itself, but also be capable of independently sustaining itself. Within the CF context, the concept of sustainment encompasses logistical, personnel and health services support. More specifically, once deployed there must be a continued flow of personnel and material from Canada to the deployed force. The deployment of the force, therefore, is only the initial component of the problem. The ability to sustain a deployed force may appear simple in comparison with the challenges associated with deploying a force. However, the nature of the deployment has the potential to make sustainment as equally demanding and challenging as the initial deployment. Sustainment does not normally require the movement of outsized cargo as does deployment. Sustainment operations may have to move large quantities of supplies. Such materials are predominately spares and consumables which are less challenging to transport, as they can be broken down into more manageable sized loads and carried by more conventional platforms, such as civilian pattern aircraft.

Overall, the ability to deploy and sustain a force away from a national support base is known as 'reach'. The concept of reach encompasses both strategic mobility, the ability to transport personnel and material over strategic distances, and strategic sustainability, the ability to sustain the force once deployed. Therefore, reach can be viewed as a combination of capabilities and mutually supporting systems.

The capability of being able to reach globally is dependent upon the composition and assigned mission of the deployed force. As one moves through the spectrum of conflict towards war, the challenges associated with achieving reach increases. Although issues surrounding deployment remain tied to the size of the force, the challenges

associated with sustainment become far more demanding, due the increased consumption of consumables. Correspondingly, as the distance away from a national support base increases, reach again becomes more difficult to achieve.

With the CF's departure from Germany in the early 1990s, Canada's ability to reach was dramatically reduced. Canada's bases in Germany facilitated forward national support and acted as a hub for global deployments. With the loss of this resource, the need for strategic reach grew in importance. Thus, challenges associated with achieving reach have been readily apparent and well recognized for at least the past decade.[9] Unfortunately, little has been accomplished over this time frame to address the capability shortfall.

Although the requirement for a global reach capability is well understood by the CF, it has been unable to propose a solution that is affordable. The CF has real funding limitations that constrains the available options for obtaining a global reach capability. Past proposals, such as the proposal to obtain a fleet of C-17s or the proposal to obtain an fleet of ships with an amphibious capability, have been platform and CF component centric and consequently have met significant resistance both internally and externally due to their forecasted costs or lack of flexibility.[10]

In the absence of any progress, the CF has approached the issue in an ad-hoc fashion and in doing so has incurred significant opportunity costs associated with each deployment. Opportunity costs associated with the use of commercial assets and foreign

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[9] David L. Rudd, *Strategic Lift: The Neglected dimension of Canadian Defence Policy*, (Halifax: Dalhousie University, 1995), 1.

[10] The proposal to purchase C-17s and the proposal to have a Join Support Ship with a well deck capable of launching landing craft are two examples of single component solutions. Both will be examined later in this paper.

military resources are funds that could have been used to procure organic assets. In addition, the absence of a doctrinal approach to reach has caused the CF to overuse and misemploy its limited organic assets thereby incurring additional costs in the form of additional operating and maintenance costs and reduced platform life expectancies.

The rapidly approaching end of service life expectancy of the CF's fleet of tactical air transports and naval replenishment vessels will almost completely erode the CF's organic reach capability. Although this appears to present a significant funding challenge, it also presents a significant opportunity as the issue of obtaining global reach will not be complicated by trying to integrate legacy equipment. With the demise of legacy equipment, the CF will not be encumbered by past decisions and will be in a position to adopt a system of systems approach to the issue.

This will enable the CF to approach the problem methodically and thus devise a system that can combine capabilities offered by existing multinational transportation agreements with new capabilities obtained through future procurement. Although the CF can continue to rely upon commercial and NATO strategic sea lift assets, it must obtain additional commercial pattern strategic air lift assets, replace its current tactical airlift assets, embrace aspects of the Revolution in Military Affairs (RMA) and adopt a hub and spoke approach to deployment and sustainment for reasons of cost, utility and reliability, if it is to obtain a global reach capability.

By examining the future security environment it will be illustrated that the CF will continue to need a global reach capability and that this capability must be able to respond quickly. Subsequently, it will be shown that embracing certain aspects of the RMA, specifically precision and digitization, will make it easier for the CF to achieve

global reach in the future. By examining how the CF is currently achieving global reach, the need to replace our current tactical airlift fleet will be emphasised and the risks associated with relying upon commercial strategic airlift will be highlighted. Subsequently, through an examination of the Future Strategic Airlift Project (FSA) it will be shown that strategic airlift can be obtained through a combination of a replacement for the current fleet of tactical aircraft, the acquisition of additional long range commercial pattern cargo aircraft and the adoption of a hub and spoke concept of operations. Furthermore, through an examination of the commercial roll-on- roll-off shipping (ro-ro) market, it will be evident that relying upon chartered sea lift posses a potential risk. With this in mind, the CF's future dependence upon the recently signed North Atlantic Treaty Organization's (NATO) Multinational Implementation Arrangement on Strategic Sealift Commitments (MIASSC) agreement for strategic sea lift will be shown to provide reasonable access to strategic sea lift. A further review of the Joint Support Ship (JSS) will reveal that its proposed joint capabilities will add little to the CF's ability to achieve reach. Finally, a reliance on MIASSC sea lift combined with a hub and spoke concept for deployment and sustainment when required will be proposed.

The Future Security Environment

Before determining how to achieve global reach, one must first examine the future security environment to get a better understanding of how the future environment will affect Canada's need for reach. Fundamental to the issue of reach is the nature of the operating environment in which a country's force is to be deployed in.

The current security environment is arguably more chaotic and less predicable than at any time in history.[11] Nevertheless, there is a belief that there are a number of long term trends that can be analysed.[12] The CF's Directorate of Defence Analysis, *Military Assessment 2002* identifies the RMA coupled with weapons proliferation, asymmetrical threats, non-traditional threats to security, resources conflict, and traditional rivalries as the issues that will shape Canada's future security environment.[13] It further describes a future security environment that contains elements of Dr. Steven Metz's five potential future scenarios.[14] These scenarios envision a world containing rogue states, transnational criminal organizations or new rogues, challenged or failing states, blocs, regional structures and the possibility of a nuclear world.[15]

Of these particular scenarios, the one that is clearly evident today and highly likely to continue is the issue of the failed state.[16] Failed or failing states are of significance to Canada because they often produce humanitarian crises and losses of territorial control. This breakdown can then cause failed states to become havens for terrorist and transnational criminal organizations.[17] Thus, a failed state warrants a

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[11] Robert D. Kaplan, *The Coming Anarchy* (Toronto: Random House, 2000), 44.

[12] Peter Johnston, *Military Assessment 2002*, Report prepared for the Directorate of Defence Analysis (Ottawa: Canada Communications Group, 2002), 1.

[13] *Ibid*. 2.

[14] Steven Metz, "Strategic Horizons: The Military Implications of Alternative Futures," (monograph, Strategic Studies Institute,1997) [journal on-line]; available from http://www.au.af.mil/au/awc/awcgate/ssi/horizon.pdf; Internet; accessed 21 April 2004.

[15] Peter Johnston, *Military Assessment 2002* . . ., 1.

[16] Rober I. Rotberg, The New Nature of Nation-State Failure, *The Washington Quarterly*, Summer 2002, 85.

[17] *Ibid*, 86.

response from the international community due to the security threat created through its loss of territorial control and on humanitarian grounds. Often, the international community will attempt to intervene prior to the complete collapse, as it is easier to stabilize a failing state than it is to rebuild one that has completely failed.[18] A clear example of this is the 2004 Canadian and international involvement with Haiti. For an intervention such as this to be successful, it is highly reliant upon the speed at which it can deploy and stabilize the country. If intervention does not occur and a humanitarian crisis occurs, as was the case in Somalia in 1993 with the collapse of the rule of law, a rapid response is again required. Within the past decade Afghanistan, Angola, Burundi, the Democratic Republic of Congo, Liberia, Sierra Leone and Sudan have all failed.[19]

The CF has sent forces to four or these failed states and is currently under pressure to send a contingent to the Sudan as part of the United Nations Standing High Readiness Brigade (SHIRBRIG).[20] The relevant factor from this current reality and highly predicted future is that a fast response is required. If the international community intervenes quickly, as seen in places like the Solomon Islands and Haiti, then the state does not completely collapse. In particular, such promptness contributes to the safety of civilians, a point identified by Peter Langille:

> The relationship between rapid deployment and the protection of civilians is readily apparent. Almost anything can happen to civilians in an area of

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18 *Ibid*, 94.

19 *Ibid*, 90.

20 "Canada Could Send Peacekeeping Force to Sudan" *Sudan Tribune*, 13 March 2004 [journal on-line]; available from http://www.sudantribune.com/article.php3?id_article=2090; Internet; accessed on 21 April 2004.

> armed conflict when national decisions and deployments are delayed by 4-to-6 months.[21]

The need for a CF rapid global deployment capability to enable interventions in failing states and to facilitate a rapid response to humanitarian crises is well recognized.

> If there is one common denominator in the continuing barrage of defence-related editorials, studies, and reports from Parliamentary committees, academic and public policy research institutes, media commentators and the Department of National Defence, it is the perceived requirement for the Canadian Forces to become more rapidly, and globally deployable.[22]

The call for a timely response to meet the demands of the future security environment clearly identifies the need for the CF to have a reach capability.

Along with the recognized need for global reach in a timely fashion to address aspects of the future security environment, there are also changes in the way the CF would like to respond. There is growing support from within the army for an early in, early out, concept of operations.[23] By limiting deployments to six months to a year, the army will benefit through the reduction in operational tempo and reduced strain on personnel.[24] This first in, first out concept can only be successful if the CF has the means to continually deploy, sustain and redeploy it forces on a regular basis. Thus, reach becomes critical to the army's desired strategic concept of operations.

Unfortunately, the budgetary realities faced by the CF on a daily basis have prevented the CF from obtaining a global reach capability and any proposed solution must address these real financial constraints. Cost has become the determining factor in

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21 Peter Langille, "Enhancing the Rapid Deployment Capacity of the Canadian Forces", CPCC, Peace Operations Working Group NGO-Government Roundtable on *The Responsibility to Protect as Part of Canada's Defence Effort*, (Ottawa: Canada Communications Group, 2003), 1.

22 Marin Shadwick, "The Strategic Airlift Enigma," *Canadian Military Journal*, Summer 2003, 63.

23 Peter Langille, "Enhancing the Rapid Deployment Capacity of the Canadian Forces. . . . 2.

determining how the CF will obtain strategic reach. Associated with this reality is the acceptance of risk. If global deployability is to be obtained on a constrained budget, then the CF's solution will not be able to meet every potential scenario. Instead, a reasonable balance between risk and capability must be established. Such a balance can be based on reasonable assumptions that will then enable a reasoned plan that accepts predetermined risks to achieve reach.

The Revolution in Military Affairs

In addition to the predicted future security environment and the CF's budgetary constraints, there are ongoing changes in the way the CF will fight in the future due to the RMA. The ongoing RMA is having a dramatic impact on the structure and nature of armed forces world wide. The CF is not immune to these changes and by addressing them will have direct impact on the CF's ability to achieve reach. The most dramatic aspects of the RMA impacting the CF's ability to achieve reach are the increase in precision and the digitization of the battle space.

Precision has always been recognised as an important attribute of any weapon system. Major General J.F.C. Fuller considered "accuracy of aim" one of the five recognisable attributes of weaponry, along with range of action, striking power, volume of fire, and portability. [25] Modern precision weapons have been able to achieve "accuracy of aim" and combined it with range, striking power and portability. [26] This has

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[24] *Ibid*, 2.

[25] Maj. Gen. J.F.C. Fuller, *Armament and History: A Study of the Influence of Armament on History: From the Dawn of Classical Warfare to the Second World War*, (New York: Charles Scribner's Sons, 1945), 7.

[26] Richard P. Hallion, Precision Guided Munitions and the New Era of Warfare, Air Power Studies Centre Paper Number 53, (Fairbairn Australia: 1995) [journal on-line]; available from

increased their lethality and decreased the number of weapons required to achieve a desired effect. In World War II, it was expected that to hit a 60 x 100 foot target with a 2000lbs unguided bomb would require over 3000 aircraft sorties and consume over 9000 bombs.[27] More recently, during the Kosovo air campaign of 1999, this same degree of accuracy was expected to be achieved by 1.5 sorties dropping 2.8 precision bombs.[28]

Similar magnitudes of precision have also been obtained across the spectrum of weapons systems. There is anecdotal evidence to indicate that an M1A2 Abrams tank now has the capability to successfully engage targets out to a distance of 4 000m.[29] This is slightly less than double the expected engagement range for the initial M1A1 variant. Thus, as the terrain dominated by the weapon is proportional to the square of its range, the A2 variant can dominate four times as much terrain as the initial version. Tactics aside, this means that one weapon system can now cover the ground that would have taken four previous systems.

Indirect fire systems have also enjoyed a geometric increase in precision. Historically, as the range of indirect weapons has increased, there has been a corresponding decrease in accuracy due to the inability to accurately model the effects of changing atmospheric conditions over the flight of the projectile. Modern technology continues to address this issue. In the very near future one can expect that a 155mm shell

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http://www.fas.org/man/dod-101/sys/smart/docs/paper53.htm#introduction; Internet; accessed on 28 February 2004.

27 *Ibid*.

28 *Ibid*.

29 The actual range remains classified; however, numerous anecdotal sources indicate that during the first Gulf War, M1 Abrams tanks were able to engage Iraqi T-72s successfully at ranges approaching 4000m using HEAT projectiles.

fired over a range of 32km will have an expected error radius of 93m.[30] This is a fourfold increase in accuracy and subsequently will reduce the number of projectiles required to achieve a desired effect by a factor of sixteen. [31]

Thus, the geometric improvements in precision are fundamentally changing the number of weapon systems and amount of ammunition required to achieve any given effect. This trend has been ongoing since WWI and can be expected to continue to produce geometric steps in increased precision. By increasing the precision of one's weapons systems, not as many will required and there will be an additional reduction in the amount of required to achieve comparable effects. Given this, it is evident that precision will make it easier for the CF to obtain reach.

A further aspect of the RMA that impacts directly upon reach is the digitization of the battle space. Digitization is a very broad concept that encompasses a host of command, control, communications, computers, intelligence and reconnaissance (C4ISR) capabilities along with computerization of sustainment functions. Both C4ISR and computerized sustainment functions will directly impact our ability to achieve reach.

C4ISR holds the promise of improved tactical situational awareness for field commanders at all levels. It is envisioned that a fully digitized force will have sufficient situational awareness of both its opponent and its own disposition giving it the ability to execute its decision action cycle faster than its opponent. This ability to execute decisions faster based on more complete information will allow a digitized force to rapidly exploit the fluidity of the modern battle field and achieve decisive victory.

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[30] Randolph Ware and Fredrick Solheim, *Wind Radar, Microwave Profiler, and GPS Data Fusion for Meoscale Modeling,* (Boulder: Army Research Laboratory, 2002), 3, A1 [journal on-line]; available from; http://www.radiometrics.com/artillery.pdf; Internet; accessed on 27 February 2004.

Furthermore, it is envisioned that C4ISR will enable a smaller force to defeat a larger, less well informed force. Thus, a digitized force will be able to deploy a smaller force to achieve the same effects that would require a larger analog force.

As deployment is only one aspect of reach, the impact that digitization will have on sustainment issues also needs to be considered. The concept of digitized sustainment encompasses a number of operating concepts and the full application of modern technology throughout the sustainment system. Many concepts such as 'just in time delivery' and 'total asset visibility' were initially developed by civilian industry and are currently being embraced by the military. Industry has since progressed from these discrete aspects of sustainment and now use the concepts of 'supply chain management' to describe the resulting system of systems that digitization has produced.[32] Within the United States (US) military, the concept of distribution-base logistics has emerged which leverages just in time delivery with total asset visibility and an efficient transportation system. [33]

Just in time delivery holds the promise of using technology to eliminate the requirement for stockpiling, by delivering the proper quantities of supplies at the required time and location. Although seemingly simple, the reality of military operations has made this concept of operation extremely difficult to achieve. The sheer quantity of information required from every sub-element of a military organization is overwhelming

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[31] *Ibid,* 3.

[32] IIT Dehli-Macmillan India Collaboration, Online Executive Development Programme, "Evolution of Supply Chain Management,"(2001) 3 [journal on-line]; available from http://www.develop.emacmillan.com/iitd/material/DirectFreeAccessHPage/SCM/ch1_ChronologicalDates.asp; Internet; accessed 29 February 2004.

[33] Mark J. O'konski "Revolution in Military Logistics: An Overview," *Army Logistician* (January-February 1999): 13 [journal on-line]; available from http://www.almc.army.mil/alog/issues/JanFeb99/MS%20364.htm; Internet; accessed 29 February 2004.

and, once obtained, requires a massive effort to constantly update. Digitization holds out the promise of providing the required information without the associated staff effort. Through the use of automatic reporting systems, imbedded sensors coupled with the global reporting system (GPS), a digitized force will know precisely what quantities of supplies are remaining and at what location. Vehicles' sensors will monitor the quantity of fuel and ammunition on-board and report this information over the digital communications backbone on a regular basis or when specifically queried. Once collected, this data will be processed and the result will be the information required to deliver precise quantities at specific locations. The requirement for stockpiles will be dramatically reduced and the ability to deliver precise quantities at the required place and time will enable the digitized force to have a reduced sustainment system employing less personnel and equipment.

Correspondingly, total asset visibility holds the promise of using technology to reduce the need for warehousing by knowing where every piece of sustainment material is at all times. Additionally, it leverages the concept of just in time delivery and applies it to all aspects of military sustainment. Through the use of linked data bases, a digitized force will monitor the consumption of all aspects of its material and as items are consumed. With a complete knowledge of what is currently available both in theatre and at home, a digitized force will make maximum use of the limited quantities of sustainment material it has before having material enter the strategic sustainment flow. This information will enable a much faster response from the transportation system, as it will have a much tighter focus and work only to deliver immediately required items.

Distribution logistics will further change the underlying principles associated with sustaining a deployed force. Currently, logistical uncertainty is overcome via mass. Large quantities of all consumables and forecasted spares are delivered during the deployment phase. Distribution logistics holds the promise of removing the uncertainty through the collection of timely information and changing the way material support is provided.

> Distribution logistics represents a whole new way of doing business. Velocity offsets mass, as echelons of inventory are replaced by managed flows of material. The key is inventory in motion. The distribution pipeline effectively becomes . . . the warehouse.[34]

This will result in a much leaner sustainment system and less of a requirement to stockpile materiel. Consequently, this will reduce the amount of material moved during the deployment phase of an operation and placed increased reliance upon the movement of material during the sustainment phase of an operation. This material will then be selectively delivered during the employment phase using the same transportation system. Thus, the application of distribution logistics will lead to a more balanced use of the transportation system. There will still be a surge in support of a deployment that must be considered but with the requirement to move stockpiles of ammunition and spares removed the scope of the deployment problem will be reduced.

The CF is currently making steps to improve the precision of its weaponry, specifically through the modernization of its CF-18 fleet and its recent purchase of the Stryker Mobile Gun System. This trend needs to continue; as it increases the CF's effectiveness at the same time it increases its ability to achieve reach. In addition, the

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[34] *Ibid,* 14.

CF's efforts at digitization of its army, specifically through the Land Forces Command and Control Information System (LFC2IS) project, need to continue and be extended into sustainment aspects. With the achievement of a fully digitized force supported by a distribution logistics system, the CF will be ideally positioned to make maximum use of transportation systems to achieve reach.

Although precision and digitization will enhance capability of a deployed force, they, by themselves, will not be sufficient to achieve reach. Depending on the nature of the deployment, specifically humanitarian aid and classical peacekeeping missions, the advantages conveyed by precision and digitization may be reduced. There will always be a requirement to deploy a force capable of establishing "boots on the ground" to achieve certain mission objectives. This coupled with tactical considerations will place a finite limit on enhancing the capabilities of specific weapon systems.[35] The advantages precision and digitization will foster on the CF's ability to achieve reach will be most pronounced when dealing with missions that are near the top of the spectrum of conflict. As the mission moves lower down in the spectrum of conflict, precision and digitization will still contribute to facilitating reach, but, the advantages conveyed will be reduced.

The CF's Current Approach to Reach

Currently, the CF has a very limited strategic airlift capability and no organic sea lift capability. This section will examine the CF's current strategic mobility capability and how the CF has relied upon commercial assets to achieve strategic reach.

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[35] Even the most sophisticated weapon system will remain vulnerable to asymmetrically threats by definition. Thus, there is a practical finite limit to increasing a weapon systems capabilities based on economics.

Furthermore, the advantages and disadvantages associated with using commercial means will be discussed along with the future of commercial strategic airlift.

The fleet of five CC-150 Polaris aircraft (Airbus A310-300) are the CF's only true strategic airlift platform. The aircraft's expected service life is estimated at 40 years and thus we can expect it to remain in service past 2020. [36] The Polaris is a twin engine commercial airliner that is easily converted to a passenger or cargo transport.[37] It can carry either 32 000kg or 194 passengers and has a range of 11 500km.[38] On the one hand, it is one of the most cost effective commercial aircraft with operating costs estimated to be ten percent less than comparable airplanes.[39] On the other hand, it cannot carry oversized cargo such as vehicles or large pieces of equipment. Moreover, as it is a commercial aircraft, it can only land at well prepared airports and requires special material handling equipment to load and off-load its cargo.

This lift capability is currently being reduced, as two Polaris are being converted into air-to-air refuellers to support the CF-18 Hornet fighter-bomber fleet.[40] This conversion will greatly improve the deployability of the CF-18 fleet as the CF will now have organic assets that will enable the CF-18 fleet to be deployed worldwide.

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[36] Brian MacDonald, "The Captial and the Future Force Crisis," in *Canada Without an Army Forces?,* ed. Douglas L. Bland (Kingston: Queens University, 2003), 34.

[37] Department of National Defence, "Canadian Forces Aircraft" [on-line web page]; available from

Unfortunately, this additional capability comes at a significant cost. The remaining three Polaris aircraft have an extremely limited capability to achieve reach by themselves.

Augmenting the Polaris fleet are the CF's 32 CC-130 Hercules. The Hercules was designed as an intra-theatre tactical transport and is capable of operating from austere runways. Its functional design and versatility have made it extremely popular world wide and has remained in production since 1955.[41] The Hercules has a range of anywhere between 3 960km to 9 790km, depending on how heavily it is loaded, and a maximum load carrying capacity of 17 320kg or 92 personnel.[42] As it is a dedicated military transport aircraft, it can handle oversized cargo, specifically the Army's Light Armoured Vehicle III (LAV 3) and all of the Army's logistics vehicles with the exception of the Heavy Logistics Vehicle Wheeled (HLVW). Its design encompasses a rear ramp that eliminates the need for any special material handling equipment. The CF's fleet of Hercules is made up of three different models that were obtained over the course of the past 40 years.

Out of the fleet of 32 Hercules, the E models are the oldest. The CF obtained 19 C-130 E models between 1964 and 1966. These aircraft have already exceeded their original estimated life expectancy (ELE) and are approaching a second ELE after receiving a life extension in 2000.[43] These aircraft have seen extensive use and are now

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41 Federation of American Scientists, "C-130." [web page on-line]; available from; http://www.fas.org/man/dod-101/sys/ac/c-130.htm; Internet; accessed on 28 February 2004.

42 *Ibid*.

43 Brian MacDonald, *Will the Canadian Forces Have What They Need When They Need It* , Report prepared for the Conference of the Institute for Research on Public Policy "Challenges to Governance: Military Interventions Abroad and Consensus At Home" November 17-19, 2000, 3 [journal on-line]; available from http://www.irpp.org/events/archive/nov00/macdonald.pdf; Internet; accessed 21 April 2004.

the "highest-time military Hercules in the world." [44] Their age and extensive use have necessitated the need for extensive maintenance. The mission ready rate for an aircraft is calculated by deducting the number of aircraft that are undergoing scheduled maintenance and aircraft that are unserviceable from the total number of aircraft in the fleet. For the CF's 19 CC-130E models, the mission ready rate is approximately 48%.[45] The extensive maintenance demands have increased the operating and maintenance cost and simultaneously reduced the number of flying hours. In 2001, Canada's Auditor-General's report identified that within the past decade the ". . . ratio of corrective maintenance hours to flying hours has doubled."[46]

The CF has an additional four C-130H models that were obtained in the 1970s. These aircraft are now over 30 years old and have approximately ten years left before they reach their ELE date. Their mission ready rate is only marginally better at 55%. [47]

The remaining nine Hercules aircraft were purchased between 1984 and 1990. Of theses, two are H84 models and were acquired in 1984. Five tactical tanker models were acquired 1990 and the finial two Hercules H-30 stretch variants were obtained in 1992.

In addition to augmenting the CF's strategic airlift, the Hercules is currently used extensively by the Search and Rescue (SAR) units throughout Canada. At any

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44 Capt Dave Marault, "Improving Hercules Availability," CF Press Release, 2003 [web page on-line]; available from http://www.forces.gc.ca./site/feature_story/2003/jul03/21e.asp; Internet; accessed 28 February 2004.

45 Major R.D. Neske "Air Mobility F/W Concept –SAR Aircraft", *National Network News*, Volume X, No 2, Summer 2003: 9.

46 Brian MacDonald, "The Capital and the Future Force. . ., 31.

47 *Ibid*, 9.

given time, ten Hercules are involved in supporting the SAR function in Canada.[48] This additional requirement is expected to remain until a dedicated fixed wing SAR aircraft is purchased. Recent announcements by the Prime Minister indicate that the CF will procure a dedicated fixed wing SAR aircraft within the next two to three years.[49] Until the new aircraft becomes operational, the CF will be forced to dedicate Hercules aircraft to the task.

Given the fleet's current mission ready rate and SAR responsibilities, there are at most three to five Hercules available to support out of country deployments. This lack of availability was highly evident during the recent CF deployment to Haiti. As the Polaris fleet and Hercules fleet were engaged in supporting Operation Apollo in Afghanistan, the CF was forced to contract out the airlift requirements to a civilian contractor.

The CF has relied heavily upon civilian contractors in the past to meet our strategic airlift requirement. The most dramatic of these is Operation Apollo. The entire deployment of the CF's contingent to the International Security Assistance Force (ISAF) was accomplished using civilian air and sea lift. The vehicles and equipment were moved from the port of Montreal by commercial ro-ro vessels to Turkey, where they were then flown into Kabul by commercial An-124-100 cargo aircraft.

The An-124-100 Condor is a former USSR strategic airlift platform that has been adapted by a trio of Russian commercial airlines to carry outsized cargo. The trio included Volga-Dneper, Polet Air Cargo and Antonov Airlines that is sold by Volga

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48 "Crisis In Canada's Air and Sea Transport Capability", *National Network News*, Volume X, No 2, Summer 2003: 8.

49 Stephen Maher, "Military Gets Two Plums," *The Halifax Herald*, 24 March 2004.

Dnepr's sales partner Air Foyle.[50] There are currently 22 An-124s in commercial service based in either Russia or the Ukraine.[51] The An-124-100 is an extremely capable aircraft that can carry loads as heavy as 150 tonnes with a range between 5 900km and 12 000km depending on the load.[52]

The issues associated with the use of commercial strategic lift assets are the cost, the airworthiness of the aircraft, the availability of the lift when needed and the potential for political interference from the commercial owner's home country.

First of all, the cost associated with chartering An-124s is expensive. Industry estimates are that to charter an An-124 cost anywhere between $13 300 to $16 000.00 per hour.[53] The cost to deploy the CF's ISAF contingent's equipment and cargo to Kabul from Turkey was $43.5 million.[54] This is the deployment only cost and one can expect a similar cost to be incurred during redeployment. It is estimated that the CF has spent over $77 million on commercial airlift since 1997 and paid another $37 million to United States for the use of their strategic airlift resources.[55]

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[50] "Flying Oversized," *Air Cargo World*, Dec 2002: 3.

[51] *Ibid*, 1,5.

[52] Air Force Technology, "AN-124 Condor Long Range Heavy Transport Aircraft, Russia," [webpage on-line]; available from; http://www.airforce-technology.com/projects/an124/index.html#specs; Internet; accessed on 29 February 2004.

[53] "Flying Oversized," *Air Cargo World*, Dec 2002, 3.

[54] Major G. Henderson, from CSC 30 lecture given on 9 December 2003. Information presented in the lecture was complied from numerous correspondence with NDHQ J4 Movements and DLBM. Permission has been granted to attribute this information.

[55] *Ibid*. The $37 million paid to the US was made under a bilateral airlift agreement for the movement of the 3 PPCLI Battalion Group to Afghanistan as part of the CF's contribution to Operation Enduring Freedom.

Secondly, the airworthiness of the An-124 fleet is a factor. Due to different crew rest standards, crew qualifications and most importantly maintenance, the CF currently has reservations about the reliability of the commercial An-124 fleet. It is the CF's unwritten policy that unless absolutely necessary for security reasons, CF personnel will not be transported by An-124.[56] This restriction is due to the poor safety record amassed by airlines of the former Soviet Union over the past decade.[57] In addition, the An-124 fleet is on average 15 years old and its serviceability is declining. [58]

Thirdly, there is no guarantee that commercial An-124s will be available when required. To address this potential problem, the Minister of National Defence, John McCallaum, signed a letter of intent on 13 June 2002 with eleven other NATO countries to from a pool of leased An-124s.[59] The idea would be for partner countries to draw from this common pool as required and thus share the cost burden associated with guaranteed access. Unfortunately, Canada's Department of National Defence's (DND) own analysis of this concept indicates that the costs associated with guaranteeing access to the required capability is prohibitive. Based upon the CF's anticipated strategic airlift requirement as identified in the Future Strategic Airlift Statement of Requirements (FSA SOR), the CF "would need guaranteed access to two An-124s within 48 hours, with two more within

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56 Major G. Henderson, CSC 30 lecture given on 9 December 2003. . .

57 Curtis, Tom, "Fatal Passenger Events Since 1990 for Airlines of the Former Soviet Union" [web page on-line]; available from http://www.airsafe.com/events/airlines/fsu.htm; Internet; accessed on 15 March 04. There have been 22 fatal aircraft incidents since 1990 involving airlines from the former Soviet Union.

58 Anne Blades, "Briefing Note for the Chief of the Air Staff," *National Network News*, Volume X, No 2, Summer 2003: 10.

59 Martin Shadwick, "The Strategic Airlift Enigma," *Canadian Military Journal*, Summer 2003: 63.

seven days for a total of 1 000 flying hours per year."[60] The life cycle cost of this arrangement is forecasted to be comparable to the purchase of six C-17 or 12 A400M aircraft, both of which would meet the FSA SOR.[61]

> This charter versus ownership comparison shows that the former option is unattractive, especially in light of the high level of risk inherent in having Canadian military commitments relying upon a former East-bloc commercial supplier. . .[62]

Finally, the issue raised by the above quote highlights the risk of political interference inherent in becoming dependent upon commercial strategic airlift. Although difficult to quantify, there exists the real possibility that either Russia or the Ukraine could limit Canada's access to commercial strategic airlift. The United Kingdom recently experienced such interference when the French commercial carrier Corsair was prevented by the French Government from moving British troops into Iraq.[63] There are any number of scenarios that could cause political interference, with the most likely being that Canada's need for commercial lift is for a mission that is contrary to the Russian's or Ukrainian's national interest. Although our countries currently enjoy cordial relations, Russia and the Ukraine have distinct national interests that are not shared by Canada or other NATO countries. To become totally dependent upon the commercial assets of a

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60 Project Office for Future Strategic Airlift and Strategic Air to Air Refuelling, "Issues on the Future Of Strategic Airlift Option: Enhanced Charter of the An124," *National Network News*, Volume X, No 2, Summer 2003: 10.

61 *Ibid*, 10.

62 *Ibid*, 10.

63 Henry Samuel and Michael Smith, "French Block Airlift of British Troops to Basra," *The Electronic Telegraph*,16 September 2003 [newspaper on-line]; available from http://portal.telegraph.co.uk/news/main.jhtml?xml3d/news/2003/09/16/wcors16.xml; Internet; accessed on 22 April 2004.

non NATO member to deploy and sustain a CF mission posses a potentially unacceptable risk.

Due to the CF's small fleet of Polaris and ageing fleet of Hercules aircraft, it has unfortunately become dependent upon commercial strategic airlift. Although currently meeting the CF's needs, a dependence upon commercial strategic airlift posses many risks for the CF including cost, safety, availability and the potential for political interference. Given that these risk factors are outside of the CF's control, there exists the real potential that commercial means may not be available when needed. This has the potential to prevent the CF from either deploying as desired or being able to deploy at all. The CF's dependence and the risks associated with commercial airlift are well understood by NDHQ planners and it is foreseen that this situation will exist for at least the next ten years as the CF is unlikely before then to take delivery of a Hercules replacement.[64]

The Future Strategic Airlift Project (FSA)

In an effort to address the problems associated with the ageing Hercules fleet and the lack of a true organic strategic airlift capability, the FSA project proposed to obtain either through lease agreements, or outright ownership a fleet (4 to 6 aircraft) of American made C-17 Globemaster IIIs. The C-17 is currently the world's most capable military strategic airlift platform.[65] It is capable of carrying outsized cargo, including every vehicle in the CF's inventory, and has an advertised payload of almost 77 tonnes. This makes it capable of transporting three of the Army's LAV III vehicles in a single

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64 Anne Blades, Briefing Note for the Chief of the Air Staff,. . . 10.

65 Boeing, "C-17 Globemaster Fact Sheet" [web page on-line]; available from http://www.boeing.com/defense-space/military/c17/c17spec.htm; Internet, accessed on 20 Mar 04.

lift. It is ramp loaded, capable of operating from austere runways and has almost unlimited range with air-to-air refuelling. Unfortunately, the C-17 is an extremely expensive aircraft with a unit price of $600 million and the forecasted project cost of owning four was approximately $3.5 billion.[66] The option of purchasing them and then leasing them back to the United States to offset the cost was rejected after issues surrounding basing, aircraft insignia and the potential for conflicting national interests could not be satisfactorily resolved.[67]

The project was halted in October of 2003 when the Minister of National Defence stated:

> In terms of demonstrating responsible management, I have made it crystal clear that Canada will not be unilaterally purchasing strategic airlift for the Canadian Forces. Only two NATO nations, the US and the UK have this capability. For a country of Canada's size, it is simply not an effective use of resources. Over the past six fiscal years, Canada has spent approximately $107 million in strategic airlift, an average of $18 million per year. This is but a mere fraction of the annual interest on the cost of our own strategic airlift – let alone the capital cost [$3.5 billion].[68]

Although at first glance, the Minister's logic appears inescapable, it fails to acknowledge the aforementioned risks associated with becoming completely dependent upon commercial strategic lift. It further displays the inconsistency between policy and action, as the former minister himself, has repeatedly acknowledged the need for the CF to obtain a global reach capability.

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66 Centre for Defence Information, "FY 03 Cost for Selected Weapon Systems" [web page on-line]; available from http://www.cdi.org/issues/budget/FY03weapons-pr.cfm; Internet; accessed on 20 Mar 04.

67 Danford W. Middlemiss and Denis Stairs, "The Canadian Forces and the Doctrine of Interoperability: The Issues," *Policy Matters*, June 2002, Vol 3, no. 7, 27.

68 The Honorable, John McCallaum, Minister of National Defence, speech October 2003.

Although the Minister has since been replaced, there has not been a renewal of interest in obtaining C-17s for the CF. The problem with obtaining C-17s for the CF is that they are highly suitable for only one aspect of the reach equation. Although they are eminently suitable to support deployments and redeployments, their capacity and operating costs makes them ill suited to carry out the sustainment aspect of most missions. The costs associated with obtaining a fleet of C-17s is unrealistic given the budgetary realities of the CF.[69]

The Enhanced Airlift Project

With the cancellation of the FSA, the Enhanced Airlift Project was established with a view to addressing the same issues as the FSA, albeit without looking at the C-17 option. Remaining platforms include the Airbus A400M, and the modern version of the Hercules, the C-130J.[70]

The C-130J has an improved range and payload capacity compared to previous versions and lower operating and maintenance costs. The C-130J is currently in full production with orders from the US Armed Forces and the United Kingdom. Although significantly improved over the C-130H models, the C-130J remains capable of carrying a single LAVIII and is incapable of carrying an HLVW due to volume and load limits.

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69 The forecasted project cost of purchasing four to six aircraft for 3.5 billion dollars is optimistic given the UK's experience. The UK entered into a seven year lease of four C-17s for $1.8 billion. Maintenance and operating costs were not included in the lease agreement and were covered under a number of smaller contracts.

70 Stephen Priestly , "Canadian Forces Future Strategic Airlifter – the Other Candidates" from the Canadian American Strategic Review [web page on-line]; available from http://www.sfu.ca/casr/101-fsa3.htm; Internet; accessed on 20 March 2004.

With an advertised range of 2 835 nautical miles fully loaded, the C-130J remains a purely tactical airlift platform. A single C-130J is expected to cost $87 million.[71]

The Airbus A400M (M for military) is a four engine turboprop aircraft designed to meet the demand for a new military cargo aircraft posed by the United Kingdom, France, Germany, Spain, Turkey, Belgium and Luxemburg. These seven countries plan to initially purchase a total of 180 aircraft. The A400M is still in the design phase; the first flight is only expected in 2009.[72] The A400M is larger than the C-130 Hercules with a greater range and an increased load capacity. Airbus industries, the manufacturer, claim that the A400M has the capability of carrying a maximum of two LAV IIIs. It also advertises that it is capable of transporting 30 tonne loads a distance of 2 450 nautical miles and 20 tonne loads 3 550 nautical miles (a single LAV III weights approx 16 950kg empty).[73] Its cargo bay will have a width of 5.40m and be at 4.0m tail[74] which will enable it to theoretically carry the HLVW. An A400M is forecasted to cost $180 million (111 million Euros).[75]

Although still not considered a strategic lift platform, the A400M is clearly more suited to moving loads over strategic distances than the C-130J. This is coupled with the ability to carry twice the load of a C-130J over a tactical distance. Although there are many other factors to consider in the selection of a new aircraft, the Airbus A400M

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71 Centre for Defence Information, "FY 03 Cost for Selected Weapon Systems," [web page on-line]; available from http://www.cdi.org/issues/budget/FY03weapons-pr.cfm; Internet; accessed on 20 Mar 04.

72 Airbus Industries, "A400" [web page on-line]; available from http://www.airbusmilitary.com/performance.html; Internet; accessed on 20 March 2004.

73 *Ibid*.

74 *Ibid*.

75 *Flug Revue,* "Airbus Military A400M" [journal on-line]; available from

appears at first glance to offer a much greater capability with a corresponding increase in price.

The success of the EAP is critical if the CF is to obtain a reach capability. Unfortunately, regardless of which platform is eventually chosen, the CF will simply be replacing an ageing tactical airlift platform with more modern tactical airlift platform. This is clearly an undesirable outcome and one that has the potential to force the CF to continue its miss-employment of tactical airlift aircraft as strategic lift aircraft. What is required, is an affordable increase in the CF's organic strategic airlift assets. The CF needs to obtain additional commercial pattern aircraft and adopt an operating concept that allows it to leverage the strengths of the different platforms.

The Polaris (Airbus A300) fleet needs to be increased to the level that it has sufficient capacity and flexibility to carry the required sustainment material to all deployed CF operations. As a minimum, the two Polaris aircraft that are being converted to air-to-air refuellers needs to be replaced and sufficient additional aircraft procured to enable the fleet to sustain three separate and concurrent CF deployments. Recently, the CF had two separate concurrent army battle group sized missions and a separate naval task force mission. Therefore, having the requirement to support three independent missions simultaneously is highly realistic.[76] Figuring that at least two aircraft on average are required to sustain a single mission and that allowances need to be made for maintenance, the CF should aim to possess a minimum of eight Polaris or similar commercial cargo carrying capable aircraft in addition to the two that will be converted to

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http://www.flug-revue.rotor.com/FRTypen/FRFLA.htm; Internet; accessed 20 March 2004.

[76] This is close to the maximum deployable force that the Army and the Navy are capable of generating at any one time. The deployment of the Army to Bosnia and Afghanistan coupled with a Naval Task Group in the Gulf region is a relevant example.

refuellers. This would require the CF to purchase an additional five Airbus A300s at approximately $150 million dollars each or an estimated total cost of $750 million.[77]

Although the numbers of aircraft required to support a specific mission is dependent on the nature of the mission which leaves the total number of aircraft required open to debate, it is the concept of using commercial aircraft to move loads over strategic distances that is relevant. In theatres where commercial pattern aircraft cannot operate, the CF needs to adopt a hub and spoke concept of operations. By establishing a hub or forward operating location that is accessible by commercial pattern aircraft as close to the theatre of operations as possible and then using tactical aircraft to complete the delivery of material, this leverages the strengths of both platforms and results in the most cost effective solution to the problem. Having proposed a concept for sustaining a mission, the concept of deployment needs to be examined.

Commercial Sea Lift

The CF has relied in the past and continues to do so today on commercial sea lift. The CF has not had within recent history a strategic sea lift capability and has instead chosen to rely upon commercial carriers. This arrangement has worked well in the past due to the number of available carriers and relatively inexpensive costs associated with sea lift. Sea lift is ideally suited to support deployments and redeployments due to massive loads that can be carried. Unfortunately, sea lift by itself is not suited to sustain a deployed force due its long transit times. The advantage associated with using

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[77] *Taipei Times,* "Cathay to Purchase Six Airbus Frieghters," 9 January 2003, 12 [journal on-line]; available from; http://www.taipeitimes.com/News/worldbiz/archives/2003/01/09/190356; Internet; accessed 25 April 2004.

commercial carriers lies with not having to crew and maintain a resource that is primarily used for the brief period associated with deployment and redeployment. This advantage comes with a price and the issues associated with the a reliance upon commercial sea lift are the availability of the desired type of ship, specifically a ro-ro, the costs and the time required to procure, load, and transit to the desired location.

A ro-ro ship is one that allows vehicles to drive onto and off the ship via a large ramp that leads to decks within the ship's hold. This type of vessel has the advantage of rapid loading and unloading of vehicles and is the most suitable type for military deployments. In addition, most modern ro-ros are also capable of carrying container cargo on their top deck. Ro-ro ships are measured in the number of available lane meters[78], with the total number of lane meters being the length of deck available for vehicles. Previous CF deployments employing ro-ro have involved organizations, as small as, company sized groups and up to fully mechanized battle groups. Lane meter requirements have varied from as little as 125 lane meters for East Timor to 4 000 lane meters for the complete Kosovo redeployment.[79] Given that the Kosovo redeployment involved moving an entire mechanized battle group, its corresponding National Support Element, and National Command Element it is now a model for future deployments and can be used as a benchmark. This is less than the number of lane meters called for in the Afloat Logistics and Sealift Capability (ALSC) Project statement of requirements.

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[78] Lane Meter - a unit of deck area for "roll on/roll off" ships: cargo vessels designed so that containers or other cargo can be rolled on and off the decks of the ship. A lane is a strip of deck 2 meters wide. A lane meter is an area of deck one lane wide and one meter long, that is, 2 square meters (21.528 square feet). Definition taken available at: http://www.unc.edu/~rowlett/units/dictL.html and http://www.udkik.dk/dictlist.jsp?l=L

[79] Briefing Note "Afloat Logistics and Sealift Capability," *National Network News*, Volume X, No 2, Summer 2003: 10.

However, it does represent the largest previous actual requirement and is a more suitable standard when examining the availability of commercial ro-ro vessels.[80]

The world wide ro-ro fleet is on average over 25 years old with an average capacity of 1 200 lane meters.[81] It is currently undergoing a shift to larger ro-ro vessels with recently delivered ships having an average capacity of 2 500 lane meters. Although the physical number of ships is being reduced, the lane meter capacity of the fleet is remaining somewhat constant, as the old smaller fleet is being replaced by fewer larger vessels that are capable of higher speeds.[82] There is also a shift on deep-sea routes away from ro-ro type vessels to Pure Car Truck Carriers (PCTC).[83] These vessels are extremely large and are designed to achieve economies of scale through the transportation of thousands of vehicles at once. A recently ordered PCTC scheduled to be delivered in 2004 will have the capacity to carry 6 400 cars.[84] These vessels require specialized port facilities to load and unload and have a limited capacity to carry military cargo as the weight and oversized nature would be problematic for PCTC vessels.

There is also a sizable demand from the United States for large older ro-ro vessels to become part of their Afloat Pre-Positioned Ship Program. The infamous GTS Katie, a vessel formerly chartered three separate times by the CF, was purchased by the United

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80 The ALSC SOR called for 7500 lane meters to move the Army's Vanguard Battle Group. Given the army's current equipment and movement away from the Leopard tank, a more realistic figure of 4000m was chosen as it represented the highest requirement to date.

81 "The Ro-Ro Market in 2002," *BRS- Shipping and Shipbuilding Markets 2003*, (Barry Rogliano Salles PLC, Paris: 2003), 86.

82 *Ibid*. 86.

83 *Ibid*, 86.

84 Beth Rubin, "Breakbulk's New Face" *The Port of Baltimore*, October 2002, 20.

States along with her three sister ships. The US subsequently refit all three ships and they are now serving with the US Military Sea Lift Command.[85] In total, the US purchased and refit 35 of the worlds 80 largest ro-ro vessels (over 4 000 lane meters) in the late 1990s.[86]

The market forecast for pure ro-ro ships is that there will be three ships scrapped for every single ship built in the near future.[87] Of the 25 pure ro-ro ships on order, only six are expected to become part of the 'tramp market' and thus eligible for charter.[88] The remaining will be used to support established routes with steady demand.[89] There have been a limited number of ships ordered since 2001 and this has coupled with the projected scraping of older vessels has led market forecasters to predict a shortage of ro-ros available for charter commencing in 2005.[90]

There are two relevant trends to the CF about the future of the ro-ro market. The ro-ro fleet will become much smaller with fewer vessels available for charter. Fortunately, the size of the remaining and newer vessels will be closer to what is required to support a deployment. Given this forecast, the CF's ability to obtain strategic sea lift on the open commercial market will be constrained past 2005 and will be forced to rely

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85 Robin Rowland, "Katie and her Sisters", CBC News Online, 22 August 2000. [journal on-line] available at http://www.cbc.ca/national/news/katie/sisters.html ;Internet; accessed on 6 November 2003.

86 "The Ro-Ro Market in 1999," *BRS- Shipping and Shipbuilding Markets 2003*, (Barry Rogliano Salles PLC, Paris: 1999), 75.

87 *Ibid*, 74.

88 *Ibid*, 75.

89 "The Ro-Ro Market in 2002,". . ., 87.

90 Beth Rubin, "Breakbulk's New Face . . ., 22.

upon more formal arrangements, such as NATO's Multinational Implementation Arrangement on Strategic Sealift Commitments, (MIASSC or AC/281)

Canada and nine other NATO countries signed the MIASSC on 1 December 2003. The agreement calls for:

> . . . implementing an amalgamated approach that consists of a combination of Ro-Ro ships on fulltime charter and assured access contracts, supplemented by national residual capacity.[91]

By entering into assured service agreements with commercial carriers, the participating NATO countries plan to obtain guaranteed access to three medium ro-ro vessels with 6 500 lane meters total. In addition, Denmark, Norway and the United Kingdom have agreed to provide national ro-ro vessels to the pool. Denmark has committed to providing one or two vessels with 4 500 lane meters total under a fulltime charter agreement. Norway has committed to providing assured access on an 'ad hoc' basis to one medium ro-ro with a 2 100 lane meter capacity. The United Kingdom has agreed to provide an access to any excess capacity from its fleet of four ro-ro ships each with a capacity of 2 400 lane meters. In total, the participating countries have agreed to pool 22 700 lane meters in total with assured access to 13 100 lane meters at all times.[92]

As a participating country, Canada does not contribute a vessel to the agreement but instead pays an equal share of the annual fee required to maintain the arrangement. As the agreement was recently signed, NATO has yet to determine the costs associated with getting the assured access to four commercial ro-ros with the 6 500 lane meter

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[91] North Atlantic Treaty Organization, *Multinational Implementation Arrangement Strategic Sealift Commitments*, AC/281-N(2003) 0046(INV), 10 December 2003, Enclosure 1, 6.

[92] *Ibid*, Enclosure 1,6.

capacity.[93] The remaining aspects of the arrangement are forecasted to cost $2.31 million annually with Canada's share estimated at $ 305 000.[94] If the CF were to request a vessel from the pool, Canada would then assume all costs associated with its use of the vessel. It is expected that these costs would be only slightly less than a straight commercial charter, as contributing countries have agreed to only charge on a cost recovery basis.[95]

This agreement is a tremendous asset to the CF. Although not guaranteeing access at all times to ro-ros, it provides an economical way for the CF to participate in a very large pool of strategic sea lift capability. As the agreement is between fellow NATO members, there is little likelihood that Canada would be prevented from making full use of the agreement due to conflicts of national interest. There is, however, a slight risk that multiple participating countries would simultaneously request to draw on the pool to participate in a significant NATO led mission forcing the CF to attempt to procure the required lift on the purely commercial market. This has the potential to be extremely expensive depending on how fast a response is required.

Nevertheless, this agreement also holds out the promise of mitigating the delay associated with procuring a commercial ro-ros. Although the details have yet to be announced, the assured access agreements will identify how quickly the assured access ro-ro vessels are to be made available. Having a known figure will be extremely beneficial as planners will then be able to work backwards and provide the government with a specific timeframe for deployment.

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93 *Ibid*, Enclosure 1, 6, note 1.

94 *Ibid*, Enclosure 1, 6.

95 *Ibid*, Enclosure 1, 6.

The new reality presented by this agreement has an overarching impact on how the CF will achieve reach in the future. We now have a reasonable assured access to sufficient strategic sealift. This directly impacts the requirements for the Joint Support Ship project currently underway.

The Joint Support Ship

The Canadian Navy's two Protecteur class AORs (Auxiliary Oil Replenishment) ships are the basis of the navy's reach capability. They have provided support to deployed naval task groups in the form of fuel, provisions, ammunition, stores, at-sea replenishment, at-sea helicopter maintenance and limited medical and dental support. In addition, they have a limited 620 lane meter capacity and no ro-ro capability. Originally launched between 1968 and 1969, the vessels were expected to have a useful life of 35 years[96] and are now approaching the end of their expected service life. In response to this reality, a replacement project called the Afloat Logistics and Sealift Capability Project (ALSC) was launched in 1992.

The project's name has since been modified to the Joint Support Ship Project (JSS). In October of 2000, the Joint Capability Requirement Board endorsed the need for three JSS vessels with the potential for a fourth depending on the costs.[97] The JSS project was recently approved by the Treasury Board and will see the first ship launched in late 2010 or early 2011.[98] Currently, the project is forecasted to cost between $1.446 billion

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96 Brian MacDonald, "The Capital and Future Force. . ., Table 2.1, 35.

97 Commander D. Harper, "Alternative Options to Meet the Afloat Logistics and Sealift Capability (ALSC) Requirement," *National Network News*, Ottawa, Summer 2003, 10.

98 Nick Brown and Richard Scot, "Supporting Cast Enters the Limelight", *Jane's Navy International*, November 01 2003, 8.

and $2.3 billion dollars.[99]Although the full capabilities of the JSS have yet to be determined, there has been a common thread throughout both the ALSC and JSS projects. Both projects have called for the AOR replacement to provide some strategic lift capability along with its AOR function.[100] It is also envisioned specifically within the JSS construct that the new vessels would be capable of providing space for either a 75 person afloat joint headquarters or a 60 bed medical facility.[101]

Originally the ALSC project contained the requirement for 7 500 lane meters of covered deck space. This was the number of lane meters thought to be required to transport the army's vanguard battle group. It was envisioned that this requirement could be met through the use of three ships with 2 500 lane meters each.[102] Further review of this requirement, based on other navies and past usage by the CF, has lead the JSS project planners to the belief that a battalion only requires 1 500 lane meters of covered deck space, with the remaining required 1 000 lane meters per ship being achieved by using the helicopter hanger and stacking containers two high on the flight deck.[103] The fact that vehicles cannot be stacked two high aside, it is evident that the JSS project is trying to reduce the covered lane meter capacity most likely to lower the cost of the vessel. It has also been stated that the JSS fleet will only provide a surge capability for the CF and will

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99 Danford W. Middlemiss and Denis Stairs, "The Canadian Forces and the Doctrine of Interoperability: The Issues," *Policy Matters*, June 2002, Vol 3, no. 7, 27.

100 Nick Brown and Richard Scot, "Supporting Cast . . ., 8.

101 *Ibid*, 8.

102 Commander L.J. Fleck, Briefing Note for the Minister "GTS Katie Comparison with ALSC," *National Network News*, Ottawa, Summer 2003, 10.

103 "Operational Considerations ALSC –Reduction in Number of Covered Lane Meters"(May 23 2001), *National Network News*, Ottawa, Summer 2003, 10.

not replace the need for chartered sealift.[104] This further begs the question of why create a JSS vessel with a lift capability, if it is not to replace the current CF dependency upon commercial vessels?

In response, the need for the navy's AOR replacement is a reality. The additional capabilities envisioned by the JSS project are likely never to be fully exploited. Canada has a bi-coastal navy and thus would require at-least one JSS ship to be stationed on the west coast. To move an army vanguard battle group would require all three JSS ships. This in itself is unrealistic, as crew readiness and vessel maintenance are likely to prevent at least one JSS from participating. Furthermore, any JSS providing support to a deployed naval task group or deployed on the wrong coast would have to transit to the sea port of embarkation. The delays associated with this has the potential to eliminate any advantage the use of organic assets has over procuring commercially, especially now considering the NATO MIASSC agreement.

Furthermore, the massing of all naval AOR resources to accomplish a single task has the real potential to impose an unacceptable restriction upon the rest of the navy. The interruption of support to ongoing naval missions and the inability to support an independent naval operation until completion of the sea lift task would have to be weighed carefully against the advantage of moving the army using organic CF assets.

The JSS's contribution to CF reach will be in providing the AOR capability to the navy. This is a critical capability that must be replaced, as the existing fleet of AORs have reached the end of their life cycle. The additional capabilities envisioned for the JSS fleet will come at a significant cost and will only marginally improve the CF's reach. The loss of AOR capability associated with the use of the JSS as either a command and

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[104] Nick Brown and Richard Scot, "Supporting Cast . . ., 8.

control platform or to provide sea lift is likely to be deemed too high and thus, it is highly unlikely that the JSS would be employed outside of its AOR role.

Hub and Spoke Model

Having signed the NATO MIASCC agreement, the CF now has a reliable source of strategic sea lift and should rely upon it as our primary means of deploying the bulk of its materiel. If the desired theatre of operations is inaccessible by sea, then the use of the hub and spoke concept must be employed again. By moving the required materiel as far forward as possible by sea and then using tactical airlift to complete the deployment into theatre, the CF would then be leveraging the strengths of its assets. By deploying in such a manner, the CF avoids trying to move deployment loads of outsized cargo over strategic distances using tactical airlift resources.

The hub and spoke concept requires that CF, and more specifically the air force, is manned and equipped to support strategic and tactical airlift operations from a forward deployed location. Historically, this has been achievable and is currently being achieved in support of Operation Apollo. An additional requirement is that the army ensure that its equipment is transportable by the replacement tactical airlift platform.

Currently the army is dependent upon its fleet of HLVWs for heavy lift, fuel and water transportation. As the HLVW does not fit in the C-130J Hercules, there is the potential for the CF to be able to deploy its army combat vehicles using organic assets but unable to deploy it army logistics vehicles should the C-130J be chosen by the Enhanced Airlift Project. This problem can be mitigated in one of two ways. Either the CF assumes the degree of risk associated with relying upon commercial strategic airlift to

move its HLVW fleet for missions it cannot get to by sea, or the army modifies its dependence upon the HLVW fleet.

For the army to modify its dependence upon the HLVW fleet would necessitate the creation of a capability to transport fuel and water using a platform other than the HLVW. This is not a significant challenge as there are a number of smaller commercial pattern vehicles that are capable of carrying bulk liquids, as well as, a number of commercially available modularized bulk liquid handling units that can be mounted on the army's Medium Logistics Vehicle Wheeled (MLVW). Furthermore, the MLVW is also reaching the end of its expected service life and is due to be replaced within the next decade. The requirement to have some bulk liquid carrying ability could easily be included in the replacement project, as the army was dependent upon a similar MLVW mounted system prior to the introduction of the HLVW.

The use of economical commercial airliners to augment organic military tactical airlift resources will enable the CF to economically achieve strategic airlift. Less expensive than dedicated military strategic lift platforms and correspondingly less capable, the CF can overcome these deficiencies through the use of a hub and spoke concept of operation involving a forward deployed location capable of supporting both commercial pattern and military tactical air operations.

Conclusion

The need for the CF to obtain a global reach capability is critical if it is to contribute to international peace and security. The future security environment will present situations where the CF will have to deploy quickly to if it is to be effective. Failing states, asymmetrical threats and humanitarian crises will continue to plague the world and the CF can expect to confront these challenging situations. Concurrently, the RMA as part of this future security environment will continue to change the way the CF operates.

The impact of increased precision and the digitization of the battle space will directly impact Canada's ability to achieve reach. Precision weapons produce geometric savings in both the quantity of weapon systems required to achieve a desired effect, as well as, a geometric savings in the quantity of munitions required. This directly impacts both aspects of the reach equation. Precision will require that fewer weapon systems be deployed and that once deployed, their appetite for munitions will be reduced. Digitization will increase the capabilities of a given force and thus enable smaller forces to achieve the desired outcome. Distribution logistics will dramatically reduce the need to stockpile and warehouse materiel. Digitized forces will require less equipment and personnel to initial deploy and will make optimal use of the transportation system to sustain deployed forces. A digitized force employing distribution logistics will present a decreased burden to deploy but will require a more flexible and responsive sustainment system. By embracing precision and digitization the CF will lessen the burden on its transportation systems and thus facilitate the achievement of reach.

The CF's current method of achieving reach has become reliant upon the use of commercial means. This is due to the lack of organic strategic sea lift assets, limited organic strategic airlift assets and the declining serviceability of the C-130 Hercules tactical airlift fleet.

This posses potentially unacceptable risks and costs as the commercial strategic airlift market is dependent upon the An-124 Condor fleet operated by Russian and Ukrainian airlines. The risks include the current inability of the CF to ensure access due to the high costs associated with a guaranteed access agreement, the questionable reliability of the aircraft itself, and the potential for political interference associated with becoming dependent upon the commercial resources of a non NATO country.

The demise of the FSA due to the overwhelming cost associated with obtaining a fleet of C-17 Globemasters has placed a renewed emphasis on the CFs need to replace its aging Hercules fleet. As discussed, the current options include the C-130J Hercules and the Airbus A400M aircraft. The success of the EAP is critical if the CF is to obtain a global reach capability. Unfortunately, replacing our aging tactical airlift fleet with a new tactical airlift fleet will be in itself insufficient to achieve a sustainable strategic airlift capability.

The CF needs to obtain additional commercial pattern airlines and adopt a hub and spoke concept of operations if it is obtain a true strategic airlift capability. It is through employing economical commercial pattern cargo airlines to move sustainment loads over strategic distances and then tactical aircraft to complete the system where required that the CF will obtain an affordable strategic airlift capability. This will require the air force to have a robust expeditionary capability and force the army to ensure that its

sustainment system is not dependent upon equipment that cannot fit into the new tactical airlift platform.

Our reliance upon commercial strategic sea lift assets, specifically the commercial ro-ro vessels is less risky. Although the market forecast for the ro-ro market sees a declining number of sufficiently large enough ro-ro vessels available for charter past the year 2005, the CF has reasonably assured access to sufficient ro-ro capability through its NATO MIASSC agreement. Although an acceptance of some risk, this assured access has the potential for the CF not to have a need to acquire its own strategic sealift capability currently planned for the JSS.

The JSS will provide the navy with a much needed replacement for its ageing AOR fleet and will contribute directly to the CF's reach capability in that capacity. The additional sea lift, command and control and medical capabilities currently envisioned in the JSS have little chance of being fully exploited due to the conflicting nature between how they would require the JSS ship to be employed and its overriding AOR function.

With a strategic airlift system optimized for sustaining a deployed force and not deployment, the CF will have to rely upon MIACSS sealift for deployment into theatre wherever possible. If direct access by sea is not possible then a hub and spoke system will have to be established with the tactical airlift fleet completing the deployment.

Although the CF can continue to rely upon commercial and NATO strategic sea lift assets, it must obtain additional commercial pattern strategic air lift assets, replace its current tactical airlift assets, embrace aspects of the revolution in military affairs and adopt a hub and spoke approach to deployment and sustainment for reasons of cost, utility and reliability, if it is to obtain a global reach capability.

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