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DND/CF Network Enabled Operations Working Paper

A DND/CF Concept Paper and Roadmap for Network Enabled Operations

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EXECUTIVE SUMMARY

1.0 Introduction

Canada's National Security Policy, *International Policy Statement Overview* and *Defence Policy Statement* outline the range of security challenges that Canada faces. The Canadian Forces (CF), supported by the Department of National Defence (DND), are responsible for providing a rapid and effective response to these security challenges as directed by government. To carry out the wide range of operations expected of them, the CF must be flexible, combat-capable and able to work closely with domestic security partners and international allies. Network Enabled Operations[1] (NEOps) provides one of the main means of accomplishing this.

2.0 Aim

DND and the CF have been thinking about NEOps for a number of years. The aim of this working paper is to assist in the development of an integrated, coordinated way ahead on NEOps by setting out a common understanding of this concept, highlighting its scope, benefits and implications, and providing a notional roadmap to exploit its potential. The implementation of NEOps across DND and the CF will evolve further as the capabilities required to implement the Defence Policy Statement are further defined in the forthcoming Defence Capabilities Plan and other Departmental policy and planning documents.

3.0 Overview

NEOps is about improving how people can most effectively use information and networks to support operations. Its implementation will likely affect how DND/CF conducts and supports the full range of military activities and is central to ongoing transformation initiatives.

To a degree, the CF is already a networked force, with joint, maritime, land, air and special operations forces using networks to improve operational effectiveness and to share information. However, serious shortfalls remain, with different operational concepts, information exchange requirements and levels of technical sophistication resulting in diverse approaches to command, operational doctrine and use of networks in the various operational environments. As a result, there is only a limited ability to exchange digital information efficiently between applications and networks, and no coherent and coordinated approach for information management, exploitation and sharing within the department to link operational commanders and staffs with required enterprise administrative support. Additionally, areas such as human factors (e.g. culture, training, selection), security, privacy, policy and doctrine require special attention.

4.0 Roadmap for Delivery of NEOps Capabilities

A Synchronized Approach to NEOps: It is envisaged that NEOps capabilities will be implemented along three axes: People, Processes[2] and Technology. It is critical that progress

[1] NEOps is defined as "An evolving concept aimed at improving the planning and execution of operations through the seamless sharing of data, information and communications technology to link people, processes and ad hoc networks in order to facilitate effective and timely interaction between sensors, leaders and effects." See p. 4/45 for additional details on the definition.

[2] Processes include policy, concept, doctrine and TTPs (tactics, techniques and procedures).

along these axes be coordinated and integrated with ongoing initiatives within DND/CF to ensure a coherent approach to the CF and institutional transformation. Considering the complexity of the concept, it is necessary to proceed in incremental steps that inform the future direction of the capability and allow for synchronization across the department (PRICIE[3]).

Building Capacity in People[4]: The role of people in NEOps is paramount. NEOps needs to identify Human Resource (HR) requirements to permit the planning and development of personnel concepts to ensure that CF and DND personnel are able to make the transition to more integrated networked operations. However, given the evolving understanding of this complex concept, significant trial, practice and exercise are required to fully identify the implications of NEOps for emerging command and control concepts. Additionally, research and study is required into areas such as the development and maintenance of trust, collaboration, and the efficiency of agile teams in order to effectively implement NEOps. The impact of the NEOps concept on such traditional HR areas as knowledge and skill, competencies, recruiting, education, training, professional development and retention also needs to be understood. Subsequently, it will be necessary to adjust cultural values to ensure they are supportive of NEOps and transformation, and supporting HR policies, procedures and doctrine will have to be revised or established. DND/CF should also review the nature and role of personnel exchanges and liaison assignments with our security partners to best support the cooperation and collaboration advocated in the *National Security Policy*.

Building Capacity through Organization and Processes: In order to explore and maximize the wide-ranging benefits of the NEOps concept, including those related to people and technology, a broad Concept Development and Experimentation (CD&E) program is required. CD&E and real world exercises involving serving and civilian members of the Defence team will contribute to the development of NEOps concepts, policy, doctrine and TTPs. The Force Generation and Effective Engagement Joint Capability Assessment Teams need to be created for a myriad of reasons, not least being to support the implementation of NEOps capability and CF transformation. Strategic level direction, priorities, policies and plans need to be developed to outline the full scope of DND/CF transformation, which will lead to an understanding of future requirements and an assessment of the implications for NEOps. The '3D' Community must be engaged to identify high priority NEOps capabilities in support of Governmental policy and to develop a plan to deliver them.

Building Capacity in Technology: The current *C4ISR* (Command, Control, Communications, Computer, Intelligence, Surveillance & Reconnaissance) *Campaign Plan* and the *Defence Information Management Strategy 2020* already outline a number of key NEOps capabilities. The development of additional capabilities through evolving concepts, strategies and plans has to be coordinated with the command and operational constructs in place or projected to be in place

[3] PRICIE. (Personnel/Leadership/Individual Training, Research & Development/Operational Research, Infrastructure/Environment and Organization, Concepts/Doctrine & Collective Training, Information Management & Technology and Equipment and Support) A good example of everything it entails is at http://lfdts.army.mil.ca/dglcd/sfiles/Capability_Development_(b).pdf - page=1 on page 4.

[4] This document is intended to be an overview of issues associated with NEOps implementation. It was written from a generic perspective, without always detailing the differing implications for military and civilian personnel since these are not fully known as yet. As NEOps is implemented, it is mandatory that the differing employment legislative requirements for both military and civilian personnel be fully addressed and that stakeholders, including unions, be fully engaged.

in the future. This entails developing a clear picture of the processes, information flows and security restrictions that the capabilities will be addressing. This implies that significant work is required to develop an understanding of existing and projected Business, Operational, Information and Security relationships created by DND/CF transformation and captured in departmental plans. The requirements, relationships and standards resulting from this process would inform the development and deployment of systems and technology to achieve the desired capability. This serves to integrate the people and process aspects of NEOps with the technical ones. It will also be necessary to align the DND's Science and Technology (S&T) Strategy and its Technology Demonstration Program (TDP) to support the development of technology to meet business and operational requirements and develop supporting NEOps capabilities. Industry should be engaged early with a view to influencing the development of the required technical capabilities.

NEOps Governance and Coordination Office: The support of DND/CF transformation through the development and implementation of a NEOps concept requires the proper authority and support. The Joint Capabilities Requirements Board (JCRB), through the Capability Development Working Group, should maintain oversight of this initiative. A NEOps Coordination Office would greatly enhance the development and integration of the many aspects of the continuing evolution of NEOps in the DND/CF. However, no action is currently anticipated in this area, since the decision to proceed with the establishment of such an office must be weighed against other DND/CF priorities.

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FOREWORD

The *International Policy Statement Overview* and *Defence Policy Statement* requires the DND/CF to give priority to Canadian and continental security, and to take a collaborative 3D (Defence, Diplomacy and Development) approach to international operations. This will necessitate the integration of maritime, land, air and special operations forces into formations such as a Special Operations Group, a Strategic Contingency Task Force, and other Mission-Specific Task Forces. This very significant transformation can be most efficiently achieved by Canada continuing to pursue and improve its Network Enabled Operations (NEOps) capabilities.

Essentially, NEOps is about how people best use information and networks to conduct and support operations in the most effective manner. Each of the CF's elements is already using networks in such a manner to a degree, but not to the extent possible and not at the level required to achieve the vision of the *International Policy Statement Overview* and *Defence Policy Statement*. Current initiatives, such as the *C4ISR* (Command, Control, Communications, Computer, Intelligence, Surveillance & Reconnaissance) *Campaign Plan* and the Technology Demonstration Program (TDP) are advancing Canada's NEOps technical capabilities, but need to be coordinated with other high-priority areas such as human factors (e.g., culture, education, training and recruiting), policy and doctrine.

From 30 November through 1 December 2004, DND/CF conducted a major Symposium on NEOps, which VCDS, DCDS and ADM (S&T) were pleased to co-sponsor. Its purpose was to examine the NEOps concept in detail and to determine its implications for future capability development. The aims of this working paper are to advance an integrated, coordinated NEOps way ahead by first establishing a common understanding of its scope, benefits, and implications; then providing the first iteration of a NEOps Concept; and, finally, providing a notional NEOps Roadmap. The implementation of NEOps across DND and the CF will evolve further as the capabilities required to implement the Defence Policy Statement are further defined in the forthcoming Defence Capabilities Plan and other Departmental policy and planning documents.

A synchronized capability approach to advancing NEOps is recommended. This approach envisages the implementation of NEOps along three axes (People, Processes and Technology). By building capacity along each axis and synchronizing, the opportunity will be created for accelerating integrated NEOps capability development. This will result in a more dynamic DND/CF, more capable of effectively operating in the future security environment to counter traditional and asymmetric threats in cooperation with a full range of international and national security and defence partners.

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I. INTRODUCTION

1.0 Background

As outlined in the *National Security Policy*, *International Policy Statement Overview* and *Defence Policy Statement*, Canada faces a range of security challenges to which the CF are responsible for providing a rapid and effective response. To do so, the CF must be flexible and combat-capable for a wide range of operations, and able to work closely with domestic security partners and our international allies. The CF seeks to address these challenges through greater integration of their sea, land, air and special operations forces, strengthening the defence of Canada and the security of North America, and becoming more globally relevant, responsive and effective in order to provide greater influence in shaping the international environment in accordance with Canadian interests and values.

As part of the overall government response to the emerging threat environment, the CF and DND are mandated to develop better integration, cooperation and coordination mechanisms in order to work more effectively with other governmental and non-governmental actors. This will involve participating in an integrated national security framework, improving communications capabilities, and enhancing threat awareness and intelligence assessment capabilities. For example, the CF's ability to sense, understand and share what is happening across Canada and North America will contribute significantly towards an integrated national surveillance and command structure capable of detecting threats and conducting effective and timely domestic and continental operations. Moreover, as part of the government-wide response to the existing and future threat environment, DND/CF must be effective and adaptive, capable of providing tactical, proportional response to specific situations. Accordingly, the Canadian military must be prepared to respond innovatively, effectively and efficiently to traditional and asymmetric threats domestically as part of an operationally focussed "Canada Command". The kind of integration, responsiveness and adaptability needed to meet these requirements is best achievable through NEOps, which is defined as "An evolving concept aimed at improving the planning and execution of operations through the seamless sharing of data, information and communications technology to link people, processes and ad hoc networks in order to facilitate effective and timely interaction between sensors, leaders and effects."

Notes:

1. This concept is intended to allow, as appropriate, joint, inter-agency, multinational and public stakeholders seamless access to information and data from a wide range of sources.

2. The intended result is an expanded awareness and comprehension of the environment, improved access to timely and relevant information, faster reaction time, better synchronization of activity, and enhanced ability to act.

Furthermore, in support of international operations, the new *Defence Policy Statement* mandates the creation of integrated, high readiness forces capable of being responsive and effective in dealing with threats arising from regional instability, particularly in failed states. As part of this, the CF will seek to operate in unison with Canadian interagency and multinational security partners. A *Team Canada* approach will seek to optimize and coordinate the international

delivery of Canadian defence, diplomacy and development efforts. NEOps provides one of the components necessary to realize this requirement.

It is asserted that the goals and intentions of the *National Security Policy* and *Defence Policy Statement* may be achieved, in part, through NEOps. Canada's land, maritime and air forces have already partially implemented this concept, but not with a common understanding of its meaning or potential and not under a common name such as NEOps. As well, under a variety of names, this concept has been adopted by many of our allies and other nations, specifically to achieve the capabilities being sought by Canada.[5] At its core, this concept is designed to significantly enhance integration and improve operational effectiveness through taking advantage of information age practices and capabilities. This document is designed to articulate DND/CF's NEOps position and intentions.

2.0 Aim

NEOps has widespread implications related to People, Processes and Technology. The aims of this document is to establish an integrated, coordinated way ahead to NEOps by:

- Establishing a common understanding of the scope, benefits, and implications of NEOps for DND/CF
- Providing the first iteration of the NEOps Concept
- Providing the first iteration of a NEOps Roadmap.[6]

The implementation of NEOps across DND and the CF will evolve further as the capabilities required to implement the Defence Policy Statement are further defined in the forthcoming Defence Capabilities Plan and other Departmental policy and planning documents. This working paper is intended to set the stage for NEOps implementation pending the development of a more holistic approach.

3.0 Assumptions, Limitations And Constraints

There are a number of assumptions associated with this document, including that:

a. since the CF and DND already use both organizational and technical networks in their day-to-day operations and support activities, and these networks increasingly discount the need for physical proximity to ensure force effectiveness, it is assumed that the current

[5] For instance, this concept, under the name Network Centric Warfare (NCW), is a pillar of the ongoing transformation of the US military. Similarly, the United Kingdom has adopted this concept as Network Enabled Capabilities (NEC) and NATO has begun its implementation under the name NATO Network Enabled Capabilities (NNEC). Sweden refers to it as Network Based Defence (NBD) and has made this concept the centre point of its future defence forces. Australia, New Zealand, Singapore, and Germany are other examples of nations that have adopted this concept. Canada's NEOps is roughly equivalent to NCW, NEC and NBD.

[6] By its very nature, this first iteration of the NEOps concept and roadmap cannot be exhaustive or detail all future requirements. While there are some documents, such as the *Defence Information Management Strategy 2020*, that already deal with some NEOps-related issues, additional development work is required in such areas as agile adaptability, bandwidth allocation, enhancing networking resource efficiency, etc, but is treated as beyond the scope of this document.

CF can already be considered a networked force to some degree**.** See Section 5.4 for details on current NEOps capabilities;

b. given the wide range of nations adopting it and the increasing body of work demonstrating its merits,[7] it is assumed that NEOps has sufficient merit to warrant continued DND/CF development and implementation of the concept;

c. any NEOps implementation will be iterative due to fiscal constraints and due to the evolving nature of the concept;

d. while this concept will initially be applied differently within joint, land, maritime, air, and special operations environments, the overriding focus of NEOps implementation must be the development of increased integration of these environments into truly joint CF operations;

e. NEOps will support, not replace, ongoing CF transformation activities and existing Capability Development and Defence Planning governance structures; and

f. whereas NEOps is foreseen as the best means of facilitating integrated operations with a range of joint, interagency, multinational and public (JIMP) partners, this document is primarily intended for a DND/CF audience. It is assumed that appropriate documentation will be produced to address the NEOps requirements of the JIMP community.[8]

As detailed in the Roadmap portion of this document, the implementation of NEOps will be influenced by progress along development axes focussed on People, Processes and Technology. Critical for these development axes is their integration with ongoing transformation initiatives.

Implementation of NEOps might be limited by the state of development of related concepts, projects and capabilities. For example, while development of the Effects Based Approach/Operations concept is progressing, it has yet to be formally adopted. Similarly, Joint Capability Assessment Teams (JCAT) for Effective Engagement and Force Generation have yet to be established and capability engineering has yet to be adopted at the program and enterprise levels. Therefore, NEOps implementation may require periodic reassessment to ensure that the implications of other policies, concepts and entities are appropriately integrated. In the meanwhile, there is no requirement to delay further implementation of this concept.

There are also risks related to the implementation of future NEOps capabilities. Since NEOps is an emerging concept, research and development is required to assess and prove more advanced aspects of the concept and to ensure that the ramifications are understood fully and addressed before implementation. While some of these issues, such as the ongoing requirement for greater bandwidth and increasingly better decision-support tools, are technical in nature, others pertain to such matters as the procedural and cultural challenges related to interoperability. Additionally, as DND/CF extends its networks and increases the amount of information passed between people and organizations, the demands upon existing support infrastructure (i.e. network support centres) will be significantly increased, thereby amplifying the chances of errors. Accordingly, the requirement for the growth and additional resource for the support

[7] See, for example, the Network Centric Operations case studies sponsored by the US Office of Force Transformation at http://oft.ccrp050.biz/docs/NCO/short-course-ndu-oct-2004/3-forsythe-nco-case-studies.

[8] For instance, see Sandy Babcock, Integrated Defence, Diplomacy and Development Through Network Enabled Operations, CORA Technical Memorandum 2005-19, June 2005, for details on a proposed infrastructure for a collaborative approach to foreign deployments by DND/CF, Foreign Affairs Canada, and the Canadian International Development Agency.

infrastructure needs to be considered. Cognitive and social aspects, such as an understanding of how individuals and teams best access and process large volumes of information, especially while under stress, need to be resolved as well.[9] Equally, there are risks associated with not advancing this concept. Many of our allies are implementing increasingly complex aspects of NEOps, an example of which is a layered Common Operating Picture (COP) that depicts a wide range of ongoing activities in a field of operations. Canada must continue to implement this concept in order to maintain the degree of interoperability required to take part in and perform effectively in future coalitions or risk not being eligible to actively participate in coalition operations and project the international influence desired by Government due to a lack of capability.

[9] See, for example, the final report of The Technical Cooperation Program (TTCP) Multinational Workshop on Network Centric Warfare, March 2004 for details on NEOps-related research and development requirements.

II. UNDERSTANDING NEOPS

4.0 NEOps Theory

The military has long recognized the advantages of integrating and synchronizing the activities of their forces engaged in military operations. In order to enhance their ability do so, numerous nations have embraced the capabilities espoused by NEOps as a core feature of their ongoing transformation.[10] NEOps builds on the business world experience that multiple pervasive channels for communication facilitate a greater sharing of information, enhanced organizational integration and improved responsiveness. Within a military context, the evolution in Information Age Practices is illustrated in Figure 1. It shows the transition from a platform-centric approach in which entities are stand-alone and have limited roles and capabilities, to an integrated systems approach in which force effectiveness is improved by select interconnectivity, and finally to a network centric approach, whereby entities have wide-spread interconnectivity and ability to coordinate actions, culminating in enhanced force effectiveness.

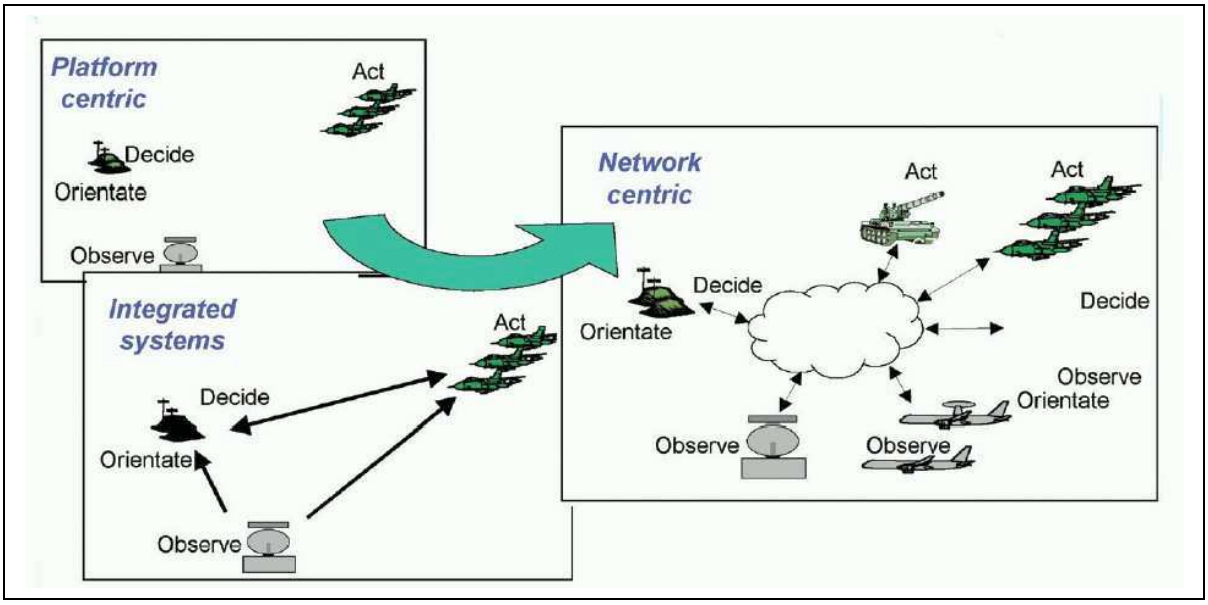

Figure 1 - Illustrative example of Information Age Practices

NEOps is an information age concept that focuses on human and organizational behaviour. In support of a Commander's intent, the commonly identified tenets of Network Centric Warfare (called NEOps in Canada) contend that a robustly networked force will lead to improved

[10] A large body of work exists on NEOps/NCW/NEC. Refer, for example, to David S. Alberts et al, *Network Centric Warfare – Developing and Leveraging Information Superiority (2nd Revised Edition)*, (Washington: CCRP, 2002), David S. Alberts, *Information Age Transformation: Getting to a 21st Century Military (Revised)*, (Washington: CCRP, 2002), and David S. Alberts and Richard E. Hayes, *Power to the Edge: Command ... Control…. In the Information Age*, (Washington: CCRP, 2003) for details on the potential of NEOps. For an example of criticisms of NEOps, see Lieutenant Colonel Ralph E. Giffin and Darryn J. Reid, "*A Woven Web of Guesses, Canto One: Network Centric Warfare and the Myth of the New Economy*", "*A Woven Web of Guesses, Canto Two: Network Centric Warfare and the Myth of Inductivism*", and "*A Woven Web of Guesses, Canto Three: Network Centric Warfare and the Virtuous Revolution*", Papers presented at the 8th International Command and Control Research & Technology Symposium, Washington, 2003.

information sharing between geographically dispersed forces. With this information sharing and collaboration, the quality of information and shared situational awareness is improved. Shared situational awareness, down to the lowest possible level, results in improved collaboration and self-synchronization[11], and these, in turn, increase mission effectiveness in support of the commander's intent.[12] Figure 2 illustrates the tenet sequence. These processes, in conjunction with new applications, tools and practices, are intended to facilitate a higher quality and speed of decision-making, which will allow a commander to get inside an enemy's "decision loop" and achieve decision superiority.

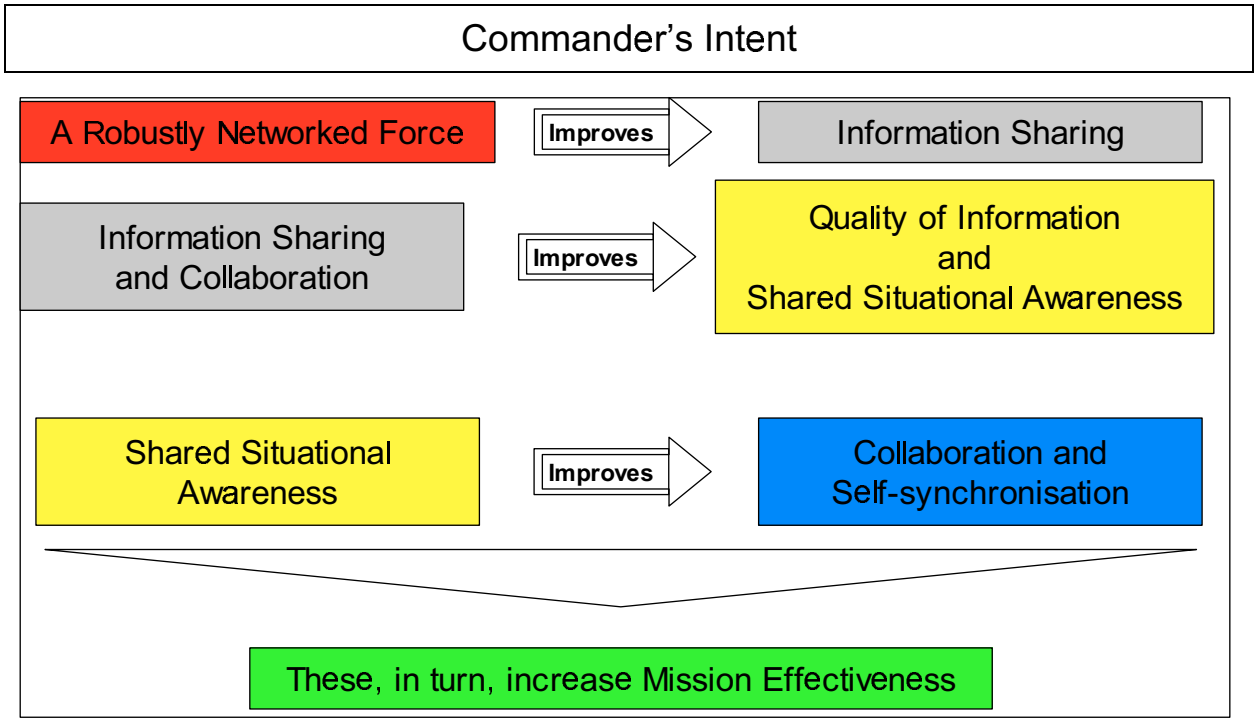

Figure 2 - NEOps Processes[13]

Notably, these tenets simply represent processes as articulated by proponents of NEOps. While there is an increasing body of work to support the claims of these proponents,[14] it would be incorrect to suggest that these processes by themselves will result in increased operational effectiveness. For instance, in sharing information it is critical that the right information gets to

[11] Whereas collaboration refers to working together through intentional cooperation between entities, self-synchronisation relates to mutually supportive actions taken by entities in accordance with an understanding of the commander's intent and their shared situational awareness, but without explicit command intervention directing such actions.

[12] Alberts et al, op. cit., pp. 88-90.

[13] It must be emphasized that merely doing the actions on the left side of the model does not automatically achieve the aims on the right side. The implementation of NEOps and the achievement of the desired improvement in effectiveness require changes in processes, people and technology, as described below.

[14] See, for example, a series of case studies sponsored by the US Office of Force Transformation (e.g., the RAND air-to-air case study described at http://www.oft.osd.mil/ncw.cfm that argues that force effectiveness is improved through this concept). Other cases studies are described in the proceedings of the 2004 Command and Control Research and Technology Symposium at http://dodccrp.org/html/events_0304.html.

the right people at the right time and that these people collaborate on a timely basis in order to improve situational awareness. Also, the quality of information is dependent on the processes, repositories and tools used to collect and share information. Shared situational awareness may improve collaboration and self-synchronization, but only if the organizational culture recognizes and rewards such activity and people are appropriately trained in their responsibilities and the requirements of the supported organizations. Therefore, further research, development and experimentation is required in order to prove, disprove or adapt elements of these tenets

While the initial development of this concept focussed on traditional military capabilities, it should, by extension, also improve the effectiveness of operations across the full spectrum of conflict and military activities, including in conjunction with a range of domestic and international governmental and non-governmental partners. In a non-traditional military scenario, the improved force effectiveness and coordination provided by NEOps will help the CF better fulfil its roles and missions, and DND provide the required support on a more timely basis. NEOps should also be viewed as one of the key means by which the effects desired by a commander may be achieved effectively.

While NEOps relates to a networked environment, it must be understood to be much more than the technological backbone that allows the efficient passage of information. As with warfare, NEOps is fundamentally a human endeavour and the human dimension is critical for the further adoption of this concept. Essentially, NEOps is about how people use networks and information to conduct and to support operations, in the most effective manner. Therefore, when implementing this concept, the ramifications across four domains (information, cognitive, social and physical) need to be addressed.[15] The information domain is where knowledge becomes codified, manipulated and shared. The cognitive domain is internal to people and is where perceptions, awareness, beliefs and values reside. It is also where mental models are created and decisions are made as the result of internal processes. The social domain is where individuals interact with others. Finally, the physical domain is where operations take place across different environments.

Figure 3, which was developed in part to help derive metrics for this concept, provides an overview of potential interactions between the domains. The completeness, quality of interactions and accuracy of this depiction remains the subject of research and development.

NEOps implies an assortment of characteristics relevant to the effectiveness of the CF and DND. NEOps seeks to provide wide information availability, which would allow a user to search, access, manipulate, post and exchange information from a variety of sources, internal and external to the field of operation. This access to information, at the lowest possible level, would contribute to a shared situational awareness, which is intended to result in a common understanding of a situation, including the intentions of friendly forces and the possible courses of action. To support this requirement, the information infrastructure must be flexible, robust and extensive. It is envisaged that this common information environment would be adaptable and agile, allowing people, sensors and systems to be dynamically grouped or configured according to mission requirements. As a result of this adaptability and the resultant shared

[15] The US-produced Network Centric Operations (NCO) Conceptual Framework identifies four domains – information, cognitive, social and physical – in the NCO/NCW decision and action chain. Reference to these domains does not represent an endorsement of the Conceptual Framework but is acknowledgement that it provides a structured means of examining ramifications of this concept.

situational awareness, force elements would be able to synchronize effects to achieve the desired effect within and between elements. Such mission execution may employ effects based planning, involving military or non-military measures, in order to achieve the specific outcome desired.[16]

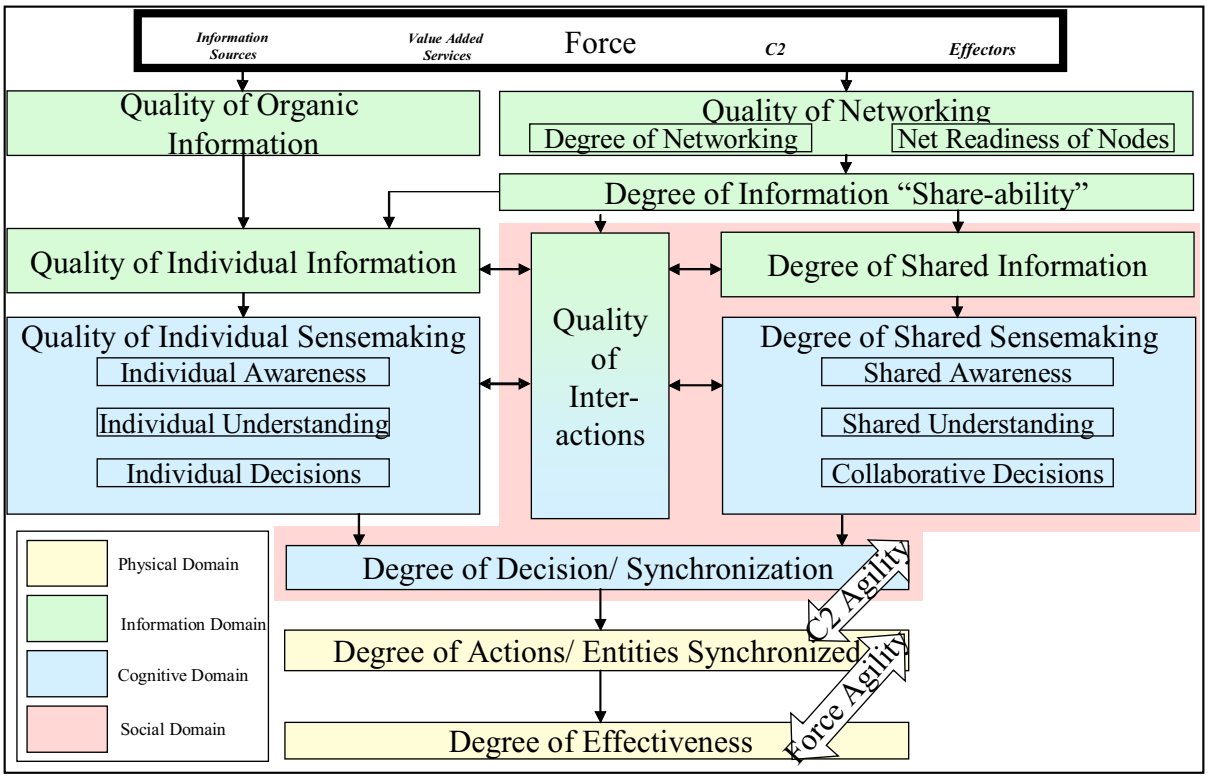

Figure 3 - NCO Conceptual Framework

5.0 Impact And Implications Of NEOps

5.1 Overview

The further adoption of NEOps by the DND/CF will be a key part of the Canadian Forces' transformation. It will likely have profound effects on organization, doctrine and culture that must be identified and understood if implementation is to be effective. Similarly, there are a number of implications (recruiting, training, education, professional development, leadership practices) that implementation of the concept must factor in, to ensure a smooth transition to a more NEOps capable CF.

[16] These characteristics were derived, in part, from DSTL/IMD/SOS/500/2, (Draft 2.0) 2 May 2003, Part 2, p. 5.

5.2 Operations in a NEOps environment

The CF, in a NEOps environment, may face a fundamental change in command and control.

Traditional views of command and control[17] in the CF related to command chains, unity of command, span of control, responsibility, accountability and resource assignment may change in a NEOps environment. Cooperation, collaboration and initiative will become more dominant attributes. The division of responsibilities between the functions of line and staff may be affected also, since the network will significantly improve reach back capabilities for line officers and will allow an enhanced role for staff officers in support of operations. Conventional service-specific command and control practices will be affected, as requirements will dictate the creation of a unique multi-service mission capability package under a single joint commander. Doctrine and TTPs will have to be constantly reviewed to ensure that best practices are adopted and modified as lessons are learned.

Through a clear understanding of the commander's intent and the operational picture, leaders will be able, and expected, to exercise increased initiative. In doing so, a balance needs to be attained between micromanagement of subordinates and excessive independence from commanders that may be possible through the broad asset visibility achievable through NEOps. The Orders procedure will be reduced, as much of the information required to execute a mission will be readily accessible by subordinate levels beforehand, allowing pre-planning in advance of orders. The availability of quality information, in a timely manner, would permit earlier in-depth planning, leading to reduced response times, and the opportunity to develop a wider range of operational alternatives. As an operation is executed, the superior information in the Common Operating Picture will permit units to anticipate requirements and modify plans to enhance accomplishment of the mission. In fact, a degree of self-synchronization will be achieved as diverse force components, acting independently but providing mutual support, work towards achieving a common goal.

A NEOps force will likely be more interoperable.

[17] Command and control are inherently a vertical construct, while cooperation and collaboration are horizontal processes.

Interoperability[18] is an intrinsic characteristic of a NEOps force. As part of this, a NEOps approach will enhance the interconnectivity of CF-specific functions, such as command, intelligence and logistics elements, and will help our military to adopt a fully integrated and unified approach to operations. This provides the basis for the development and maintenance of a dynamic and continuously updated COP,[19] which would be available to diverse force components. Such interoperability would allow, for instance, a deployed land force platoon or detachment to call upon close air support, seamlessly and directly, with a full understanding of the location, intention and capability of nearby friendly forces, including cross-boundary actions. NEOps will provide the ability to work more effectively with allies, coalition participants and a range of governmental and non-governmental defence and security partners to achieve a common goal, with due consideration of any legal, jurisdictional and proprietary constraints.

Issues that need to be resolved in association with increased interoperability includes identifying information exchange requirements and identifying supporting common standards to allow information to move between different software systems in use by different nations and partners. Current initiatives in these areas need to continue.

A NEOps force should be able to attain and sustain a higher pace of operations during deployments.

During the conduct of a specific mission, NEOps should facilitate a higher pace of operations. By better understanding the mission and the battlespace, as it evolves through the information and knowledge shared over the network, DND/CF has the potential to act and react to achieve the desired end-state, before an adversary is prepared to respond. This increased operational pace would also decrease the military effectiveness of an adversary, who may have difficulty taking offensive action because of the requirement to respond to our initiatives. Alternatively, NEOps should assist a commander to keep more effective control of the pace of events, by keeping courses of action open and fostering flexibility and adaptability, thereby being able to exploit an adversary's reaction to events.

[18] Enhancing interoperability increases the functionality of adaptive human networks to share information, collaboratively analyse problems, and collectively develop and execute mutually supporting courses of action to achieve the integrated effects necessary to meet Government objectives. It is the aggregate of 5 interdependent interoperability domains: *Physical* (the ability of tangible or concrete systems to connect and be compatible, including equipment and components), *Information* (the ability to share information, including technological and procedural aspects), *Cognitive* (the ability of non-tangible processes, including perception and thinking, to be compatible as reflected in similar doctrine and decision processes), *Social and cultural (*the ability to effectively integrate activities with partners beyond traditional social and cultural boundaries), and *Behavioural* (the ability to carry out interdependent courses of action in an integrated and synergistic manner). All domains are applicable within the CF and any partner organization engaged in the provision of security and defence. They are mutually supporting, interdependent, and within our collective control. However, to enable the CF to succeed in conducting *interdependent courses of action in an integrated and synergistic manner* within a whole of Government approach to national security, the most critical domain is behavioural interoperability.

[19] Different users of a network will have a range of views and understanding of an operational picture and varying abilities to access information. This makes a truly "common" operating picture difficult to achieve; however, this term will be used to reflect the potential and intended state.

A NEOps force should be more operationally agile.

NEOps should enable the CF to become more agile - able to adapt quickly and without significant formal reorganization, in order to carry out a wide range of operations at home and abroad. This kind of agility may be critical to the overall goal of integrated operations, by enabling the CF to mass the effects of geographically dispersed forces to achieve goals when and where desired. This provides the ability to better task tailor a force by bringing together only those capabilities required for a specific mission, thereby enhancing force manoeuvrability. Additionally, by operating in a dispersed manner until brought together for a select purpose, deployed CF elements would provide a less concentrated target for any opponent and be more mobile than a larger, concentrated force. However, NEOps alone does not increase agility; traditional elements of agility, such as the physical ability to manoeuvre, remain critical.

A NEOps force requires a high degree of trust.

Implicit in the effective implementation of NEOps is the development, within the network, of trust[20], which is essential if members of the network are to share information and collaborate freely. A key component of this will be the ability to agilely adapt information exchange controls between people to meet requirements. In addition to the kind of trust needed between entities and individuals operating together in low or high intensity conflicts, there is a requirement for trust between military and non-military partners working towards achieving common goals. To achieve this, DND/CF needs to foster good relations with the full range of potential interagency, multinational and public partners to help facilitate the building of trust and the implementation of a Team Canada approach. Personal contact and the establishment of social networks are an integral part of this. The intent and capabilities of DND/CF and its interagency, multinational and public partners need to be understood by each other, so that the mutual benefits achievable through cooperation are identified and nurtured while protecting the independence of non-military agencies. For instance, a development or aid agency operating in a potentially hostile environment benefits from the security provided by deployed CF personnel. Information sharing between DND/CF and such entities may very well be uneven and more beneficial to such actors than to DND/CF, but so long as the activities of these agencies are supportive of the overall thrust of Canada's diplomatic, defence or development goals, then it is in the interest of DND/CF to be accommodating. The building of trust in these circumstances will not be automatic or easily achieved; rather, it will be an iterative and uneven, but necessary, pursuit.

5.3 Development of NEOps within the DND/CF will require new approaches.

The imperatives of day-to-day operations and readiness and the uncertainties of resource availability demand a phased, balanced and forces-wide implementation strategy for NEOps.

[20] Trust, in this instance, is used in the context of belief in the reliability of others, not the information technology usage pertaining to the measurable outcome from a vulnerability assessment.

Given the reality of limited resources and the demands of ongoing operations, development of a NEOps capability will need to be phased. This implies that legacy systems will be eliminated gradually, as new capabilities with enhanced NEOps functionality are introduced. This will also necessitate the development of coherent, integrated policies, plans, doctrine and acquisition programmes, that ensure a balanced, forces-wide implementation of NEOps, while maintaining or improving operational effectiveness. The Integrated Soldier System Project (ISSP), a Land Force acquisition project, is one example of a NEOps project beginning to address these issues.

NEOps may affect all parts of the DND/CF and its development must inform and shape all aspects of the institution, from organization and doctrine to personnel policies, education and training.

The role of people in NEOps is paramount, as the maximum benefit of the concept is only achievable in an environment where initiative is a valued and cultivated trait, and where trust throughout the organization is an inherent attribute. NEOps envisages an appropriate decentralization of authority and creation of autonomy, similar in many ways to the land force's concept of mission command. This demands that commanders at all levels deal with an incomplete operational picture and decide when it is time to act and when they must wait for additional information. Such an environment requires knowledgeable, confident leaders with the ability and initiative to act.

In order to guarantee quality personnel, able to operate effectively in a NEOps environment, all aspects of Human Resource planning and development must be informed by the evolving NEOps concept. The objective must be a personnel system that emphasizes initiative, risk taking and trust, and that develops the adaptability and agility essential for effective NEOps. This will require the development and nurturing of policies, procedures, doctrine and organizational values, which establish a climate that fosters and maintains the culture essential to realizing this new capability. Similarly, it will require the shaping of organizational behaviours and practices, to ensure effective recruiting, training, education and professional development of the new force. Additionally, a part of this training and education must consider how best to work with interagency, multinational and public partners. An increase in the number of exchange and liaison positions between DND/CF and such partners is one means of achieving this goal.

Instituting the NEOps concept will be a complex undertaking and the demands on people within DND/CF will be immense. Therefore, a DND/CF Human Resources (HR) Strategic Operating Concept has been developed which specifically addresses these issues. While reference should be made directly to that document for detailed examination of HR implications of NEOps, Figure 4 provides an indication of the foreseen role of NEOps for overall DND/CF HR strategic plans. In essence, these HR strategies will help foster the cultural changes needed within DND/CF to fully achieve NEOps.

New command and control practices may require changes to DND/CF culture in order to achieve greater information sharing and collaboration, higher levels of trust and greater devolution of authority.

Gompert et al give an interesting perspective[21] on networking in warfare where time is critical. They feel that the right formula for improving cognitive performance is a combination of more timely reasoning and more reliable intuition. What is called for is the integration of reasoning

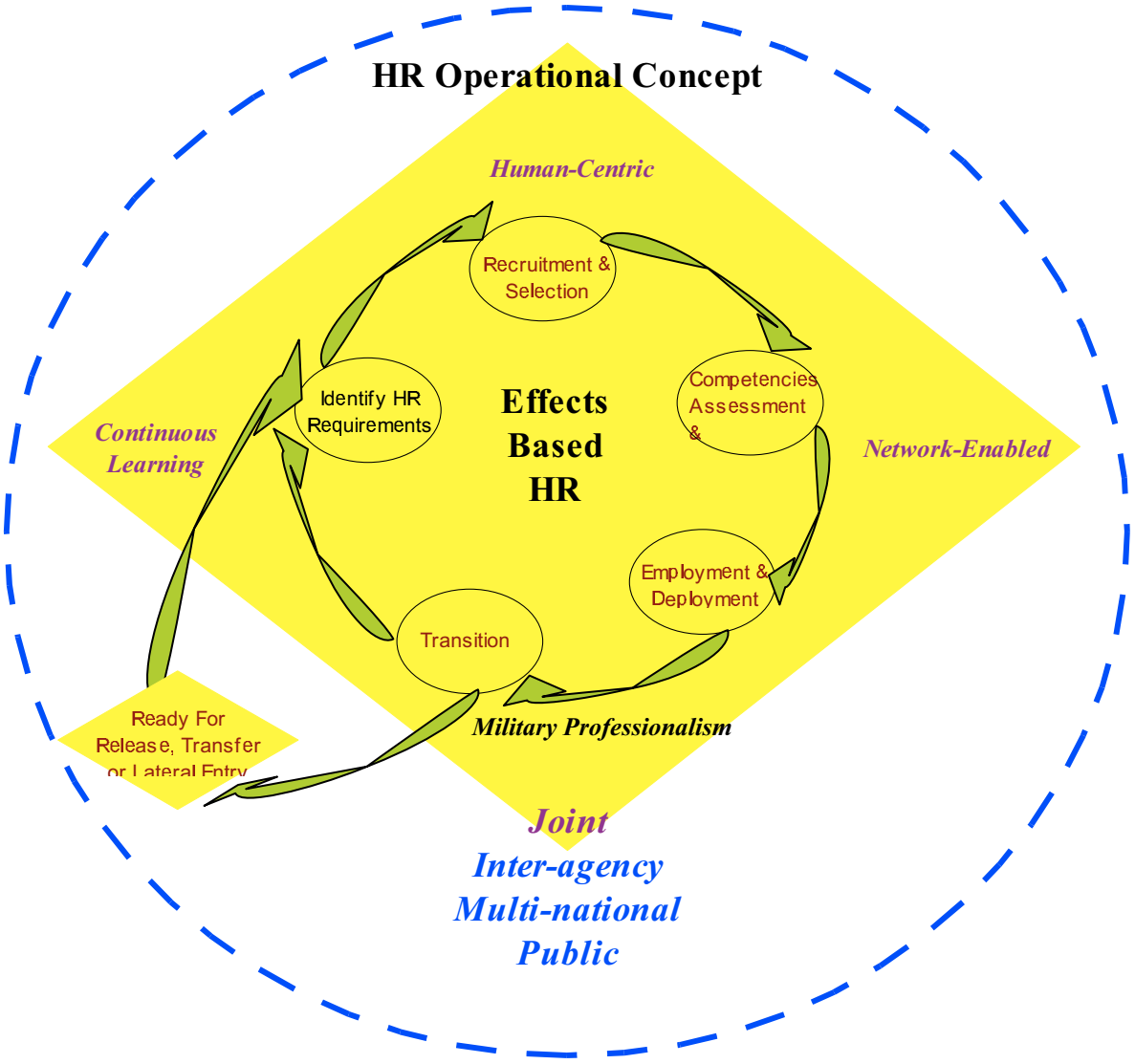

Figure 4 - HR Operational Concept

and intuition into what is called *battle-wisdom.* This is defined as the ability to decide and act in urgent, complex, high-stakes situations through well-developed self-awareness, intuition, reasoning, and leveraging of networks. Battle-wise individuals, teams and forces can create time-information advantages by making swift but sound decisions in the heat and fog of combat. In such circumstances, decentralizing decision-making authority is required. In support of this, flexible, horizontal collaboration between military personnel and units is increasingly important, which is a capability not readily achievable because communication networks are designed commonly to support vertical command and control only. This approach assumes that the highest power of information is achieved through enabling people to share and properly use it. For this, the development of cognitive abilities is crucial. This allows people to form an

[21] David C. Gompert et al, *Battle-Wise - Gaining Advantage in Networked Warfare*, (Center for Technology and National Security Policy: National Defence University, January 2005), p.6.

understanding of a situation and to decide what information to access on the network, which requires both awareness and judgment. However, until enough tactical-level officers are sufficiently battle-wise to make good use of information from the network, senior commanders understandably will be reluctant to delegate, and they may be tempted to micromanage, using the detailed information that increasingly will be displayed before them. This speaks to the requirement to appropriately train both senior and subordinate level personnel on evolving command and control practices.

Despite this significant focus on the human dimension of NEOps, there remains a need to continue to adopt and integrate technology into DND/CF.[22] DND/CF must remain open to innovation, strive to adopt emerging technology and extend its networks, sensors and command systems as much and as far as possible. Accordingly, acquisition for the CF must be capable of supporting the rapid insertion of new technologies and facilitate coherence between acquisition programs. As an example of this, the ISSP envisages three cyclical builds over a nine-year implementation period in order to maximize technology insertion.

5.4 Current NEOps Status

As indicated earlier, the joint, maritime, land and air components of the CF already have NEOps capabilities in one form or another. As well, other government departments, especially Public Safety and Emergency Preparedness Canada (PSEPC), have taken conceptual steps towards NEOps-like capabilities. This section will provide a preliminary description of the NEOps status of these various entities.

5.4.1 Joint

Significant work has been completed within the DCDS group on implementing capabilities that leverage the tenets of the NEOps concept. The work to date in the command and sense capability area has resulted in the development and implementation of a C4ISR initiative. This initiative has developed several products including Command Guidance, CF C4ISR Campaign Plan, and the Target Integration Model 2008 (TIM 08). The Command Guidance confirms the intent of CF leadership and provides an overall governance structure, which in turn empowers the C4ISR team by enabling them to develop and implement C4ISR capabilities as part of a networked environment. The CF C4ISR Campaign Plan provides consistent context for capability development in this area by enabling all parts of DND/CF involved in the development, implementation, and use of C4ISR capabilities to have a common framework for their efforts. In detail, this Campaign Plan has developed a series of C4ISR goals, e.g. TIM 08, in order to focus effort in the near and medium term. Each of these goals focus on using technological networks to enable people and organizations to share data, information and services in a manner that ensures that the right person gets the right information at the right time. In support of this, five thrust lines have been developed in order to manage the sub-components of the capability area as they move from concept through implementation and into day-to-day use. As a result of these initiatives, the CF has realized significant increases in the operational effectiveness in the capability areas of Command and Sense.

[22] For example, the US military is spending billions of dollars to establish a Global Information Grid (GIG) and the UK military recently has committed several billion pounds to overhaul its information technology.

5.4.2 Maritime Force

For several years, the maritime force has been conducting an ongoing transformation effort to re-balance capabilities, in order to better reflect and respond to global, continental and national security issues. As part of this, interoperability has proven to be inextricably linked to the future success of the Canadian maritime force and it has consequently embraced NEOps.

Domestically, the maritime force is continuing activities associated with the development of joint and integrated C4ISR[23] capabilities on all three coasts through the ongoing deployment of an interconnected web of high frequency surface wave radars, UAVs, helicopters, maritime patrol aircraft, ships and submarines in order to establish and maintain maritime security. In keeping with NEOps principles, these capabilities will be fully integrated into the Government of Canada Operations Centre in support of Canada's *National Security Policy*.

Advances in NEOps capabilities for the Canadian maritime force are exemplified internationally by preparations for ongoing and future naval deployments with allies. This is particularly true in relation to the continued integration of Canadian HALIFAX Class FFHs into USN Carrier Strike Groups throughout the full training-to-deployment cycle. As the USN is the recognised leader in NCW, the Canadian maritime force has made great strides and investments in order to maintain network interoperability from the tactical through to the strategic levels of information management with its closest neighbour and ally.[24]

From a human factors perspective, the maritime force has taken steps to ensure that personnel are capable of fully exploiting the information. It has established new training and infrastructure programmes to ensure that future "information users" are properly supported by "information managers", specially trained to provide timely and useful data throughout the sensor to shooter cycle. At the same time, the naval reserve has transformed to increase the pool of intelligence expertise capable of using such information and contributing to domestic operations.
Finally, a robust, forward-looking strategic doctrine has been developed to underpin the Canadian maritime force's vision of the future. This clearly identifies NEOps as central to its response to tomorrow's security and threat environments.

5.4.3 Land Force

Within the land force, the changing nature of gathering, processing and using information in decision-making and the execution of operations is perhaps the single most important advance to affect military operations in the near future.[25]

In order to be successful on the future battlefield, the land force must transform itself to exploit command-centric warfare.[26] Command-centric warfare can be considered the linking of a global system of systems, which in effect connects all key elements to produce one shared awareness

[23] *Leadmark: The Navy's Strategy for 2020* (Ottawa: National Defence Headquarters/Chief of the Maritime Staff, 2001), pp. 128-130.
[24] Ibid.
[25] *The Force Employment Concept for the Army* (2004), p. 10.
[26] *Future Force - Concepts for Future Army Capabilities*, (2003), p. 101.

network distributed to the lowest possible levels. This networking will greatly enhance situational awareness across the battlespace and allow for more effective and rapid coordination and response to opportunities created by digitization of the battlespace.[27]

The ability to use information and knowledge to create situational awareness and understanding is an ongoing process. The key to acquiring this capability is to develop a way of fighting that is agile enough to adapt to adversaries who will attempt to neutralize our technological advantage. The Canadian land force's success depends not only upon technology but also upon soldiers who are capable of adapting the technology to the existing conditions to achieve tactical success. Since it is improbable that situational awareness will ever be perfect or extend to all levels, the land force must be prepared to exploit what information is available but remain confident and comfortable when operating in situations of uncertainty.[28]

Increasingly, the land force will deploy NEOps capabilities to subordinate levels.[29] Capital acquisition projects such as Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) and ISSP will deliver significant NEOps capabilities. That said, it is imperative that the Land Staff adopt a balanced approach to NEOps, since it cannot accept a high level of risk by investing in technology prematurely. The challenge will be to select the right technologies at the right time to complement the crucial human networking aspects of the profession of arms. Significant R&D projects, such as the Soldier Information Requirements (SIREQ) Technology Demonstration, have been conducted in order to reduce this risk. The SIREQ aim was to improve Command Execution, Target Acquisition and Situational Awareness for the 2010-2015 timeframe. The key question was "Why" technology and not "What" technology. In short, the land force NEOps position focuses on human networks first, then on the enabling capabilities provided by affordable technological networks.

5.4.4 Air Force

NEOps is already central to the Canadian air force's vision for the future. Its recent *Strategic Vectors: The Air Force Transformation Vision* articulates the intent of moving "from a primarily static, platform-focussed air force to an expeditionary, network-enabled, capability based and results-focussed Aerospace Force"[30] and specifically foresees NEOps as a means of improving collaboration, synchronization and speed of command in order to dramatically increase mission effectiveness.[31] To deliver this enhanced capability for the air force, *Strategic Vectors* asserts that the networking of sensors, decision makers, and tactical units is essential to achieving the increased information sharing and situational awareness required for its future force.[32]

Strategic Vectors acknowledges that NEOps will have implications in the physical, information and cognitive domains, implying that further exploration of this concept by the air force likely will result in the identification of considerations across the full range of capability areas, not just in relation to operations, command, and information and intelligence. It also indicates that this

[27] Ibid., p. 100.
[28] *The Force Employment Concept for the Army* (2004), p. 11.
[29] Ibid., p.39.
[30] *Strategic Vectors: The Air Force Transformation Vision*, (Ottawa: National Defence Headquarters/Chief of the Air Staff, 2004), p. 33.
[31] Ibid., p. 35.
[32] Ibid.

concept will influence CF aerospace doctrine, acquisition programmes, operations, training, and professional development.[33] In specific reference to future air force operations, *Strategic Vectors* foresees a role for NEOps in relation to the conduct of precision strikes, the engagement of time-sensitive targets, interoperability with other CF elements, OGD partners and allies, the identification of entities in the battle space in order to minimize fratricide or collateral damage, and the facilitation of effect-based operations. Clearly, the air force already has identified NEOps as a main component of force transformation activities.

5.4.5 Other Government Departments

Canada recognizes that the increasingly complex and dangerous operating environment, requires a more integrated approach to how the elements of national power are exercised.[34] This was addressed, in part, in the 2004 policy statement *Securing an Open Society: Canada's National Security Policy*, in which the federal government initiated various significant measures towards the establishment of a collaborative security environment. This was especially so in reference to domestic operations. For instance, PSEPC was provided with the mandate to test and audit the level of security readiness and capabilities across departmental lines. PSEPC was also assigned the responsibility for establishing and operating a Government Operations Centre during a national emergency. In support of this Operations Centre, a National Emergency Response System (NERS) will provide the emergency response framework in support of incident identification, warning and notification, information sharing, incident analysis, planning, and operations coordination. Beyond the boundaries of PSEPC, this policy also mentioned the appointment of a National Security Advisor, the creation of an Integrated Threat Assessment Centre, networked Marine Security Operations Centres, and a range of other intelligence, emergency planning and management, public health, transport security and border security measures.[35]

While the term NEOps is not directly used in reference to these upgrades to Canadian domestic security, there are indications that, in some instances, NEOps-related precepts are being adopted. PSEPC has participated in the NEOps developmental work. Also it is advocating NEOps aspects such as information post and smart pull for their NERS and a collaborative environment as part of any inter-departmental response to incidents.[36] However, NERS is still in the planning stage and is designed to operate only in times of domestic emergency. There is, in fact, no collaborative network in place at the strategic level for planning activities between government departments for domestic or international operations.[37] As another example of advances to a comprehensive NEOps environment, the Marine Security Operations Centres, are maintaining a COP and using network connectivity between selected departments to plan and conduct joint operations at the regional level.

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[33] Ibid., p. 36.
[34] *Securing an Open Society: Canada's National Security Policy*, (Ottawa: Privy Council Office, 2004), pp. iii and 51.
[35] Ibid., pp. vii-x.
[36] Mr. Pierre Gagnon, Acting Director, Plans and Major Events, PSEPC, *NERS Briefing* (.ppt), slides 15-30 inclusive, 8 February 2005.
[37] In the absence of such a collaborative network being established, DND/CF could facilitate interactive planning activities by selectively extending DND/CF networks to appropriate representatives in other government departments.

In relation to the international environment, the *National Security Policy* and *International Policy Statement Overview* advocate increasing the integration between 3D elements in support of a "Team Canada" approach.[38] In exercising the elements of national power internationally, Canada will seek to advance its interests and values by focussing on selected threats, partners and institutions in order to achieve defined policy outcomes.[39] Initiatives identified in the *International Policy Statement* include improving surveillance capabilities,[40] increasing the CF's ability to collaborate with Allies in counterterrorism operations,[41] and focussing on integrated operations in order to achieve the effect desired.[42] A critical element will be the establishment of a Stabilization and Reconstruction Task Force to plan and coordinate rapid and integrated civilian responses to international crises.[43] An appreciation of NEOps will assist Canada in putting together a 'whole of Canada' (i.e. civilian and military) response. In addition to the creation of effective human networks, NEOps provides the capability to plan, coordinate and act in the integrated manner proposed by the Government.

5.5 Future Vision For NEOps

In support of the development of modern, effective, combat capable, and deployable armed forces, the following NEOps-related characteristics are proposed for the CF:

a. the ability to operate domestically and internationally from the lowest tactical to the strategic level in a multidimensional environment, capably coordinating and operating in a multi-agency and global operating environment. This means that extensive interoperability would be paramount;

b. a command climate that would emphasize mission command involving the decentralized execution of operations within the context of mission intent. In future CF operations, unity of purpose and effort would be achieved through the commander's intent, while success in execution would be achieved best by properly task tailored subordinate, decentralized forces. Such decentralized execution would significantly enhance the responsiveness of the CF, by allowing subordinate commanders to develop and execute innovative and timely solutions. Robust networking would assist by providing information to subordinate commanders to create a shared view of the battlespace and by allowing for rapid feedback loops through which all users could share lessons learned and disseminate acquired knowledge. This ability to conduct dispersed operations implies the importance of trust and autonomy, without which decentralized operations cannot be conducted. To support these changes, the current Operational Planning Process should be reviewed and amended, if required, to address NEOps processes and practices;

c. a culture of risk mitigation within DND/CF, combined with appropriate risk acceptance, more tolerant of misfortune or error would be adopted. An integral component of this would be mutual trust, which must accompany delegated authority. This risk tolerance

[38] See, for example, *Securing an Open Society: Canada's National Security Policy*, p. 47.
[39] *A Role of Pride and Influence in the World: Canada's International Security Policy Statement,* (Ottawa: Department of Foreign Affairs and International Trade, 2005), pp. 2-3.
[40] Ibid., p. 8.
[41] Ibid., p. 12.
[42] Ibid., p. 14.
[43] Ibid., p. 13.

may very well not extend to the public domain, thereby affecting what risks are politically acceptable for DND/CF to take;

d. the ability to achieve decision superiority through robust human and technological networks. Sensors, decision makers, support services, and effectors will be networked to achieve shared battlespace awareness, increased speed of command, higher operational tempo, greater lethality, increased survivability, and enhanced adaptability;

e. a networked Common Operational Dataset (COD) that would provide deployed elements with reach-back or push forward of information in support of such functions as intelligence, fire support, combat service support, and other information. For example, sustainment requirements could be proactively anticipated and delivered through situational awareness obtained from the COP; and

f. the ability to be more agile, through rapid adaptation to emerging circumstances and being able to apply innovative problem solving at the lowest levels. Agility is explicitly understood to include the characteristics of robustness, resilience, responsiveness, flexibility, innovation adaptation and anticipation. Moreover, agility in this context implies an acquisition system that is flexible enough to allow changes to requirements in order to address emerging trends and technologies, thereby significantly contributing to the continued effectiveness of the CF in the future.

Enhanced integration remains a compelling aspect of the functionality provided by NEOps. In relating how NEOps integration will help develop a more interoperable and coherent approach to CF force development and operations, Figure 5 provides an overview of the core functions and interrelationship between the four functional areas of command and sense, effective engagement, force generation, and support, sustain and mobility. Operational effectiveness depends upon activities in each of these areas.[44] NEOps is intended to improve the speed and the quality of the interactions between the functional areas (i.e. decisions within the Command and Sense functional area will drive activities within the Support, Sustain and Mobility domain in advance of formal orders based upon an understanding of the commander's intent and from situational awareness from the COP).

[44] It should be noted that the Command and Sense, and Support, Sustain and Mobility JCATs have been established, the Force Generation JCAT is in the process of being created, and that, as of the publication of this document, the Effective Engagement JCAT has yet to be stood-up. See Annex A for recommendations concerning the JCATs.

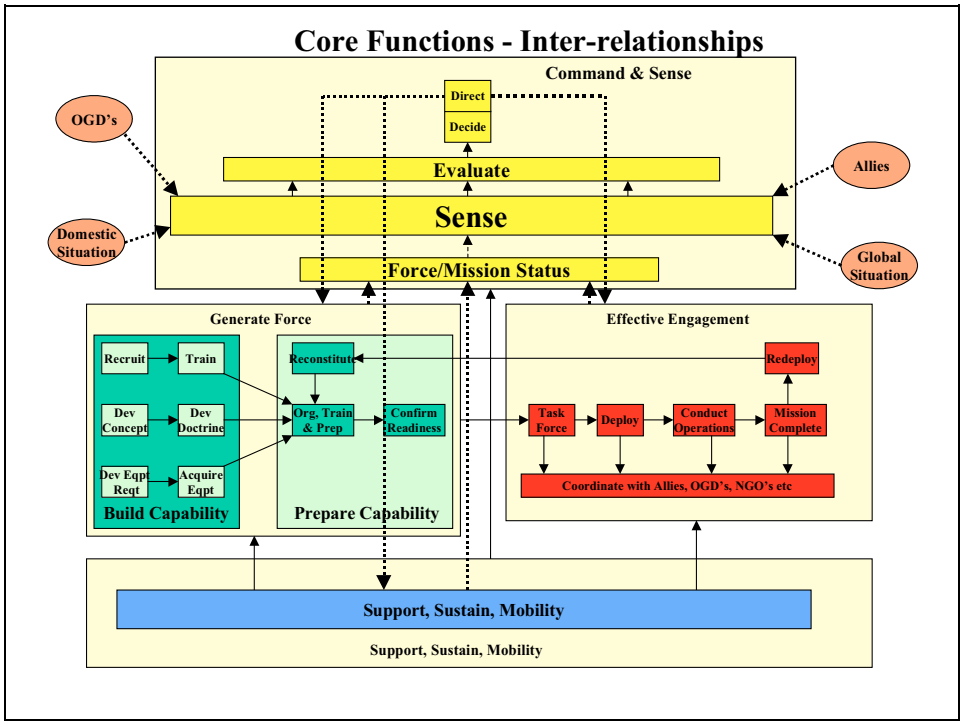

Figure 5 – Core Functions – Interrelationships

Whereas NEOps is intended to foster the rapid, focused and effective exchange of information, this does not eliminate the requirement for information to be secured against inappropriate disclosure – security remains a valid military requirement and the "need to know" will have to be balanced against the "need to share". In order to properly protect information to retain the trust of close allies (releasability), of the public (privacy) and other governments, militaries and NGOs (security), and to comply with current legislation and agreements in a manner supportive to NEOps, DND/CF needs to re-design its security/privacy architecture, develop reliable tools and processes to make it work. Possible security solutions within a NEOps environment range from the creation of separate domains for specific operations, the implementation of systems that provide for information based access control and privilege management, and the development of an approved, software-based encryption capability. Since security risk avoidance is too restrictive, the development of a CF NEOps security solution should pursue the creation of a management structure supporting role-based access control and privilege management, and involving appropriate threat and risk assessments, to allow informed command acceptance of risk dependent upon operational requirements. Further research and development is required in order to develop adequate measures to ensure that suitable security precautions are implemented as part of the overall adoption of NEOps.

5.6 Challenges

There are several challenges to implementing a networked capability such as the one described above. Firstly, NEOps represent an emerging concept. As such, it continues to evolve and will have to be managed closely during its development and implementation. Therefore, a flexible implementation strategy is required. NEOps will also require changes to existing process and technology, resulting in business transformation challenges. Managing these will require a

change management approach that uses a series of synchronized developments in order to integrate various initiatives in the areas of people, process and technology. Simply connecting various networks and providing common software applications does not result in the benefits of network enabled operations being realized; suitable people and process capabilities also need to be developed and implemented in order to achieve the potential of NEOps. Finally, there is a risk of a single point of failure should all capabilities utilize a single network. Therefore, not only must the technological network be robust and reliable, but individuals and organizations must be prepared to operate in the event of a technological failure.

5.7 Conclusion

In summary, NEOps is an information age concept that focuses on human and organizational behaviour, and is intended to increase mission effectiveness. The CF already has aspects of such a networked force, but there are elements missing in order to achieve the functionality required by the CF, including Canada Command, and Team Canada approach as directed in the *National Security Policy* and *Defence Policy Statement*. Steps to address these shortfalls are outlined in the next section.

III. DELIVERING NEOps: ROADMAP

6.0 Introduction

This initial iteration of the NEOps Roadmap presents an integrated approach for increasing the operational effectiveness of the CF through NEOps. As detailed in the section below, advancing NEOps requires building capacity in many areas. Particularly important is the synchronization of efforts as developments occur along the axes described below; the intent is to field NEOps capabilities as they become available in order to learn by doing and to support these activities, as necessary, through research and development, and study. Included below are a series of recommendations that are designed to provide a focus for NEOps and initiate an integrated DND/CF and a Canadian Security Partners' approach.

7.0 A Synchronized Capability Approach to NEOps

The approach to the implementation of NEOps must be well planned, focussed, prioritized and affordable. A NEOps force must constantly assess and adopt, as warranted, new approaches and technologies and adapt to new situations. These processes will never end, as evolving practices and technologies will be examined continuously for possible adoption. Thus the approach to building the NEOps Force must institutionalize these processes of examination, and selective adoption and adaptation, and it must exercise agility and speed in doing so to ensure force effectiveness. Foremost, DND/CF will learn by doing. Changes brought about by this evolutionary process must be underpinned by the tenets of NEOps. It is also readily acknowledged that DND/CF will not change for change's sake; new processes and technologies will be adopted only when it is advantageous to do so. This methodology must not only be applicable to operations but also to how DND/CF develops and generates the future force. A synchronized capability approach to building the future NEOps Force is envisaged. This approach involves building capacity along three axes:

a. People: Included would be the development of a NEOps Recruitment, Education, Training, and Retention Campaign plan; a Canadian NEOps Human R&D program; a human NEOps CD&E program; and a NEOps education program including e-courses and formal curriculum courses. A series of studies will also be required on topics such as Commander's intent in a NEOps environment, cultural aspects, inculcation and maintenance of trust, and retention of people with highly desirable NEOps skills. Experience from working in a NEOps environment will result in changes. Exchanges and training opportunities with OGDs and interagency partners would facilitate development of valuable skills[45];

b. Processes:[46] DND/CF will learn by doing. To support this approach, there will be a detailed operations research analysis of the organisation envisaged by the new high-level strategic documents, the establishment of a comprehensive Canadian NEOps CD&E program (including modelling and simulation), and real-world exercises to help establish policy, doctrine and TTPs. Also included would be the creation of the capacity to generate policy, doctrine and TTPs for the future NEOps Force; and

[45] Any of these measures involving civilian personnel necessitates the identification of the occupations/occupation groups that may be involved and the full involvement of and negotiation with unions.
[46] Processes include policy, concepts, doctrine and TTPs.

c. Technology: Included would be the establishment of enterprise-wide (including 3D partners and Allies) connectivity, information management and collaboration; an optimized, synchronized DND/CF S&T Strategy and TDP; integration of industry and Allies S&T advances; and the creation of processes for Rapid NEOps Capability Generation and Insertion.

Developments along these three axes would be coordinated through a newly created NEOps Coordination Office, which would also be responsible for updating and refining the NEOps Concept and Roadmap, and providing NEOps-related guidance and expertise. Three overlapping steps are seen in NEOps capability development. The first is to build capacity along each axis, the second is to synchronize the three axes, and the third is to take advantage of the synergy presented by the synchronization to accelerate integrated NEOps capability development.

Recommendation: Institute a three axes approach to building the future NEOps Force consisting of People, Processes and Technology.

7.1 Learning By Doing

Central to DND/CF's implementation of NEOps will be a "learning by doing" approach, which can be integrated into each of the People, Processes and Technology axes. While some risks exists in doing so, given the pace of development associated with NEOps and the experiences of other nations in fielding such capabilities, this should be minimal. The benefits of doing so include quicker adoption and operationalization of this concept, enhanced combat capability and contributing to a cultural shift within DND/CF supportive of transformation.

Recommendation: Adopt a "learning by doing" approach to operationalizing NEOps.

8.0 Building NEOps Capacity in People

8.1 Introduction

NEOps derives its effectiveness through human behaviour in a networked environment. It is the human considerations that have lagged in the effort to build information age, transformed forces. The purpose of this section is to examine the human issues as they relate to NEOps. Two of the four NEOps domains deal directly with the human. See Section II (Understanding NEOps) for a discussion of the cognitive and social NEOps domains.

It is important that civilian personnel are a critical element of the Defence Team and that they are subject to different employment legislation from that of military members and the majority of the civilian personnel are unionized. None of the recommendations that follow concerning building NEOps capacity in people, including those in relation to recruitment, education, training and retention, is intended to be binding at this time and must be the subject of negotiation with appropriate authorities before implemented. Such negotiation and legislative requirements may result in different solutions and approaches between military and civilian personnel.

8.2 Culture

NEOps requires the optimized sharing of information, teamwork and a collaborative working environment. Currently, these activities are very often not valued nearly as much as individual accomplishments. Moreover, the current culture needs to progress towards increased interdependence between the CF elements and national security partners while maintaining or increasing interoperability with international security partners. The establishment of Canada Command and Team Canada approaches to operations requires a cultural shift and would be greatly facilitated by advancing the NEOps approach. Experience during training and deployments will influence developments. These all influence the nature and degree of trust, which is an essential feature of the culture required for NEOps and is especially required in decentralized decision-making (within the Commander's intent) and self-synchronization. Trust is also particularly important between domestic and international security partners for effective NEOps operations to take place.

Recommendations:

a. Carry out an interdepartmental/interagency analysis of the cultural aspects of the Canada Command and Team Canada approaches to future operations enabled by NEOps and determine what could be done to facilitate the required cultural change. The exchange of personnel between 3D partners would be a means to build cultural acclimation between participating organizations;

b. Carry out a study on the nature of trust in NEOps and how trust can be inculcated and maintained in decentralised decision making and self-synchronization; and

c. Initiate a Canada-wide discussion on NEOps with other partners, both inside and outside government.

8.3 Human Resource System

The contribution of the Human Resource System in developing human capability has often been viewed in the narrow roles of recruitment, education/training, and retention. These roles are, of course, important but they do not represent a complete account of the implications of NEOps for the HR System. In order to align human development to support this concept, the following issues require attention:

a. Recruitment and selection;

b. Professional and Leadership Development, including the dimensions of experience, education, training; and inculcating military professionalism and ethos;

c. Knowledge Management. Systems and practices must support continuous learning and sharing, and the capability to link people to share and generate knowledge, and grow experienced people faster than currently done;

d. Reward, recognition and compensation. These areas must be firmly tied to expected results and behaviors at the team and individual levels. Individuals and teams must be able to sustain trust, commitment and engagement, and align with organizational strategies;

e. Career management to support and build the appropriate 'human networks';

f. Occupational structures. This will include a competency and task based system of work/job analysis to enable strategic organizational transformation and networked-tailored groups;

g. Retention programs to ensure that the best people are retained and developed;

h. Transition, re-employment, and post-service employability strategies to sustain long-term human capital investments and leverage human networks across a productive life;

i. Wellness and well being issues; and

j. Lateral entry.

These HR dimensions must work within an integrated and synergistic framework to facilitate larger organizational strategies. They must also integrate human factors research in order to enhance military effectiveness. It is also noteworthy that while a DND/CF Human Resources (HR) Strategic Operating Concept has been developed at the NDHQ level, the maritime, land and air forces have a significant role and authority in the areas of recruitment, education, training and retention. Their concerns would have to be addressed and any confliction resolved as a part of any NEOps-inspired HR activities.

8.4 Recruiting

It will be more important than ever before to recruit people with the advanced cognitive and social skills (or trainable to those levels) required to work in a NEOps environment. Also required is the willingness to take responsibility for their part in collaborative decision making earlier in their career. The comprehensive identification of the skills and competencies necessary in a networked environment is required, as well as a profile to find, filter and attract the right people. Lateral entry could be used to bring in highly desirable people who have the skills for analysis under pressure, learning in action, making sense out of large volumes of information, and making decisions in the face of complexity, uncertainty and risk of failure. Such people could be brought in above entry level and provided with the military training required to operate in the CF.[47]

[47] Gompert et al, p. 24.

Recommendation: Initiate studies on:

a. The identification of skills and competencies required in a NEOps environment;
b. The development of a profile to find, filter and attract the right people; and
c. The recruitment and military training of people above entry level with the right highly developed cognitive and social skills to operate in a NEOps environment.

8.5 Education and Training

The people dimension of NEOps requires the education and training of all DND/CF personnel so that they can use their skills, knowledge and experience to exploit it and contribute to its future development. During deployments and even every day operations, people will need to learn how to share and find information from multiple sources and then use that information to plan and make decisions. To support operations, they will need to use all available system tools to exploit information, and they will need time to adapt to a more open culture, requiring greater sharing and trust between colleagues and coalition partners. While it is true that DND/CF have always needed such skills, in the future NEOps will provide network-based information management and decision support tools to help with the process. Measures such as training, teambuilding activities and organization development will be required to build trust and confidence between people across organizations who may have to collaborate on a distributed and temporary basis. Certain skills will be generic to all users but there will also be a need for specialists in some areas, for example network security specialists.

A NEOps Education and Individual Training Strategy needs to address every dimension of learning, including e-learning[48], from initial entry, through basic and advanced training and education, to professional development. The dimensions of learning range from technical content to fields of expert knowledge to social/cultural skills. There is also a requirement to carry out Collective Training, especially command teams. They will need to ensure that they are able to draw maximum benefit from the networked environment. Individuals, teams and larger groups of people will need to learn about interoperability within and between distributed and temporary communities of interest, and understand the impact of networked operations on existing processes, doctrine and organizational structures.[49]

The implications of a NEOps approach to how people carry out their responsibilities will be significant and the full potential of NEOps will only begin to be realised when participants understand what it offers. An education program to build knowledge of NEOps and to encourage an information-centric culture is a fundamental building block of NEOps.[50]

[48] E-learning is the capacity to receive, share and collaborate through various information communication technologies and refers to both the method and the content of learning.
[49] *Network Enabled Capability, JSP 777Edn,* (London: UK Ministry of Defence, January 2005), p. 9.
[50] Ibid, p. 9.

Of value to Canada and this NEOps initiative is the work of the TTCP in this area. Specific R&D issues dealing with the cognitive and social domains have been identified and R&D programs have been created.[51]

Recommendations:

a. Develop a NEOps Recruitment, Education, Training, and Retention Campaign Plan (to be assigned as a high initial priority for the Force Generation JCAT as soon as it is formed);

b. Develop:

i. General awareness and familiarity training on NEOps and the issues involved for current military and civilian staff. This could be in the form of an e-course. Included in this should be staff officers, acquisition staff and policy makers.

ii. A NEOps educational program, which will be integrated into Canada's military/training institutions, that identifies the importance of information sharing and develops the required information-centric culture. A purposeful, coherent strategy and implementation plan for the development of NEOps individuals must be part of this program; and

c. Ensure that the results of the TTCP Study on R&D of the cognitive and social domains are used to advance NEOps in Canada.

8.6 Retention

The re-shaping of the work force, including the retention of high quality people, is an area requiring specific attention. The development of highly skilled NEOps individuals with strong cognitive skills may increase the problem of retention. These people will be in high demand in the private sector. However, there is evidence that, if an organization gives people marketable skills, they will actually stay in longer than if they do not receive such skills. There is a strong correlation of psychological commitment and loyalty with an organisation's efforts to make an individual more marketable. In addition to addressing the problem of retention, ways must be found to find more suitable employment for those who cannot function well in a NEOps environment.

Recommendation: Carry out a study to find ways to enhance the retention of people with highly desirable NEOps abilities and facilitate the movement (deployment) of those who do not have the requisite skills to remain in a NEOps environment.

[51] *The TTCP NCW Enterprise*, (NCW Strategic Integration Team, December 2004).

8.7 Collaboration: Developing Intelligent Teams

The *Defence Policy Statement* emphasizes the establishment of fully integrated units capable of timely, focussed and effective responses to foreign or domestic threats to Canadian security. Maritime, land, air and special operations forces will emphasize cooperation and teamwork at all levels to achieve a total effect greater than the sum of the individual parts. From a NEOps point of view, these units or teams will require shared situational awareness and need to be able to form agile groupings[52] capable of highly adaptive command and control, responsive logistics, dynamic battlespace management and a high level of collaborative distributed working skills.[53]

The issues of decision making and problem solving within newly formed, agile military teams require experimentation to help determine the best way ahead. While evidence suggests that collaboration is usually better than solo problem solving, it may not be all that simple. There is a time-information trade-off between the cognitive speed, agility, surprise, and adaptability that comes from individual decision-making versus the quality of decisions informed by the views of members of a team. Therefore, there is a need to consider whether collective or individual problem solving is best when trying to maximize anticipation, reaction speed, opportunism, and fast adaptation.

In order to implement the new DND/CF vision, considerable cross-service training is warranted. However, it will take substantial resources and organizational innovation to plan exercise scenarios involving various combinations of, for example, special operations forces, air, land and maritime assets. It will not be easy to build trust and appreciation of how teammates approach problems if the teams form only after a threat or opportunity appears. Operational experience will directly influence how agile groupings are developed and fielded. The concept of collective wisdom in military operations—creating as well as using it—requires much more thought, research, and experimentation.

Even more importantly, cross functional teams are needed beyond the traditional boundaries of DND and the CF. The role and nature of personnel exchanges and liaison assignments from the CF and DND with our security partners should be reviewed to best support the cooperation and collaboration advocated in the *National Security Policy*.

Recommendations:

a. Carry out a detailed study, leading to experimentation, of collaboration in a NEOps environment and the efficiency of agile groupings (or ad-hoc teams) under various scenarios, including military conflict; and

b. Optimize existing DND and CF exchange and liaison programmes, and consider the establishment of new programmes across the full range of our security partners.

[52] "Agile groupings" is intended to reflect a less permanent formation than is denoted by the term "team", and reflects an ability to bring together resources and capabilities quickly in order to achieve a purpose before returning to their original role and formation.

[53] Gompert et al, p. 30 and *Network Enabled Capability, JSP 777Edn.,* p. 16.

8.8 Command, Control and Commander's Intent

In transitioning to a NEOps force, it is vital that the CF develop a coherent understanding of command and control (C2) in this new environment. In this context, it is important to determine how much decentralization of C2 is practical, under different conditions and limitations. Ideally, rules or guidelines for such decentralization should be developed to act as guidance in operations. The R&D identified and being carried out by TTCP in this area will help in providing increased understanding of these issues.[54] C2 is one area where close collaboration in R&D with our allies and security partners is especially beneficial due to interoperability.

Recommendation: Conduct a detailed study on the changes to command, control and commander's intent in a NEOps environment. This study should establish how much decentralization of decision making is possible, the conditions for this to happen and the limitations of decision making at various levels.

8.8.1 Human R&D Issues

Human factors are amongst the most important but least understood issues in developing an effective NEOps capability. Experience during operations will influence how NEOps should be fielded. If the gains from NEOps are to be optimized, the associated human R&D issues need to be examined on a priority basis. The following are considered some of the key NEOps HR research issues:

a. the cultural shift required to operate within the Commander's intent in a NEOps environment;

b. the antecedents of trust in a NEOps context and the ability to maintain trust;

c. the most suitable organizational structures to facilitate devolved command and, as required, replacement of centralised and hierarchical structures with flexible and 'flatter' structures;

d. the type and mix of military and civilian personnel required for a NEOps environment and the recruiting policies required to achieve them;

e. the mix of skills and characteristics required by personnel in a NEOps environment and how to recruit, train and retain this mix;

f. the level of integration required to work effectively in integrated teams and the extent to which personnel can be educated into thinking and behaving cooperatively and collaboratively within and between mixed teams;

g. the alignment of recognition and reward systems with the resulting organizational, team and operational constructs to reinforce desired behaviours in a networked force and support the retention of trained personnel;

h. the degree of change necessary to achieve "jointness" and working in integrated teams. Consideration needs to be given to joint exercises, joint assessment and common military institutions starting from recruit schools. Critically, this also extends to conducting research

[54] *The TTCP NCW Enterprise*, (NCW Strategic Integration Team, December 2004)

and development into making the changes necessary to work effectively within a 3D environment. Training to reinforce this requirement is required at all rank levels; and

i.the structural, organisational, and pedagogical effect of centralizing training by competencies, rather than by environments should be carried out as a matter of urgency.[55]

A Canadian NEOps HR R&D program should be given high priority, be tightly coupled with operational priorities and training/education functions, and be closely integrated with CD&E and the NEOps Coordination Office.

Recommendation: Establish a Canadian NEOps HR R&D program.

8.8.2 CD&E Focussed on the Human

Given the range of implications of NEOps for people (i.e. social, cognitive, trust, how C2 is exercised), there remains a range of human-related issues that require investigation in order to determine how best to implement this concept. Therefore, as work on the *C4ISR Campaign Plan*, *Defence Information Management Strategy 2020*, the range of R&D programs recommended and other initiatives proceeds, it will be especially important to construct a comprehensive CD&E program addressing the human implications of NEOps.

Recommendation: Develop a comprehensive human NEOps CD&E program coordinated with all of the key DND/CF stakeholders.

8.8.3 Centre for the Human in Transformation

There are many issues related to the human dimension of NEOps and all DND/CF organisations have a direct stake in the human aspects of transformation. Given that NEOps is a cornerstone of transformation, a coordinated approach is essential. It is suggested that an effective means of achieving such a coordinated approach is to establish a DND/CF Centre of Excellence for the Human in Transformation. Once the DND/CF Centre of Excellence is established, consideration should be given to making it a NATO Centre of Excellence.

Recommendation: Create a DND/CF Centre of Excellence for the Human in Transformation. Ensure that all key players, such as ADM(HR-Mil), ADM (HR-Civ), ADM (IM), ADM(S&T), VCDS, DCDS, and the ECSs, have direct input and representation.

[55] Leoni Warne et al, *The Network Centric Warrior: The Human Dimension of Network Centric Warfare*, (Melbourne: Australian Defence Force Headquarters/DSTO-CR-0373, July 2004).

9.0 Building NEOps Capacity in Processes

9.1 Introduction

Achieving the future force envisaged in the NEOps Concept will require considerable effort in operations research, Concept Development (including further development of the NEOps integrating concept into its functional and employment concepts) and Experimentation (including modeling and simulation), S&T and live exercises. These activities will lead to new strategies and policies leading to the fielding of new capabilities, which will likely result in modifications to the processes as experience dictates. It is from these activities that doctrine and TTPs would be developed.

9.2 Operations Research Analysis of Strategic Documentation

One of the early critical steps is a detailed Operations Research analysis of recent Canadian strategic documents to help delineate organizational and networking aspects. These documents include: The *International Policy Statement Overview, Defence Policy Statement*, *National Security Policy*, and *Defence Information Management Strategy 2020*. The design of the networked force will need to be reviewed on a cyclical basis as DND/CF strategy evolves. An analysis of the degree of networking required with DND/CF 3D partners is also required.

Recommendations:

a. Carry out a detailed Operations Research analysis of Canada's key Strategic Documentation to derive a picture of organizational aspects of the Future Force and to delineate more closely the requirements for networking; and

b. Conduct an Operations Research analysis to define the requirement for a NEOps approach between DND/CF and its diplomatic, security, and development partners.

9.3 Concept Development and Experimentation

A comprehensive NEOps Concept Development and Experimentation program is required to further explore the NEOps concept, its functional and employment concepts and help generate the policy, doctrine and TTPs for the future NEOps Force. This CD&E program should include Canada's 3D and Allied partners.

Recommendation: The CFEC and the Environmental CD&E Centres should establish an integrated NEOps CD&E approach to evaluate the effectiveness of the concept and help generate the policy, doctrine and TTPs required by the Future Force. This program should leverage Allies' and NATO CD&E efforts.

9.4 Development of Processes

In conjunction with the NEOps CD&E program, efforts need to be devoted to the development of NEOps policy, doctrine and TTPs. This work will be greatly facilitated by the completion of strategic direction and of the establishment of the Effective Engagement and Force Generation JCATs.[56] The Working Paper produced for the November 2004 NEOps Symposium[57] contains a detailed analysis of the capabilities required by the future force in the four functional areas of command and sense, effective engagement, force generation, and support, sustain and mobility. Examples of these capabilities include the ability to: engage in expeditionary operations employing shared situational awareness; achieve self-synchronized and integrated coalition military operations; apply the effect of massed forces from widely dispersed geographical locations; be inherently agile, etc. Real world experience will influence the development of processes. Once the capabilities for the future force are more firmly identified, the work of the current CDS Action Teams is complete and the Effective Engagement and Force Generation JCATs are functioning, then the work on policy can be profitably initiated, and force generators and force employers can develop appropriate doctrine and TTPs. This work must be integrated with the NEOps CD&E Program.

Recommendations:

a. Expedite the establishment of the Force Generation and Effective Engagement JCATs in order to be able to take a holistic, collaborative approach to NEOps and other key transformational aspects;

b. The JCATs shall identify and prioritize the resolution of capability deficiencies, leading to the development of policy, doctrine and TTPs for the future NEOps Force by functional authorities (Level 1s). This work will be facilitated by the analysis done in support of the Working Paper for the NEOps Symposium; and

c. Establish synergies between policy, doctrine and TTP production and the NEOps CD&E Program.

10.0 Building NEOps Technological Capacity

10.1 Introduction

Building capacity along the NEOps Technology axis will require the establishment of an enterprise-wide approach to connectivity, information management and collaboration. It will also involve the optimization, strengthening and integration of the current NEOps related efforts in the Defence Research and Development Canada (DRDC) Strategy and its TDP. Many network technological advances (e.g. security, software, operating systems, etc) are generated by industry. These must be evaluated and exploited by DND/CF if appropriate. Finally, the issue

[56] JCATs already exist for Command and Sense and Support, Sustain and Mobility.
[57] Network Enabled Operations: DND/CF Responding to the New Security Environment (5 November 2004).

of technical interoperability between our services, with our 3D partners and with our Allies must be pro-actively addressed.

10.2 An Enterprise-Wide Approach to Connectivity, Information Management and Collaboration

10.2.1 The C4ISR Campaign Plan[58]

The vision of the C4ISR Campaign Plan (CP)[59] is "An effective CF-wide Command and Control capability that achieves operational advantage across the entire spectrum of military operations, through the attainment of trusted and relevant information in a timely manner." This capability was seen to be integrated throughout the force structure and to provide a secure knowledge-sharing environment. It was recognised that a CF more focussed on the development and dissemination of relevant information would be more capable of synchronizing operations – through the attainment of better shared understanding and shared intent – to achieve concentration of effort. "Distributed operations – spread geographically, but combined in effect – could be better supported…Collaboration and knowledge-sharing should be made a goal of all CF units and focussed upon, within appropriate business plans…Focussing on the development and accessibility of relevant information tends to decentralize the decision-making process." In addition, the C4ISR CP calls for an "enterprise" approach for the development and service of all IM initiatives and core processes. It calls for the establishment and maintenance of continuous real-time interoperability with the information systems of OGDs and with our principal allies. The establishment and maintenance of a CF-wide situational awareness capability is a prime goal of the C4ISR CP. Other features include the availability of a common set of automated tools to assist CF joint planning and decision making; the establishment of metadata standards for C4ISR databases and a process of information management.

C4ISR transformation is based on five-year "convergence points" known as Target Integration Models (TIMs). Each TIM will describe the key capability components that are to be achieved within that five-year period. By 2008 (the first TIM or TIM08), the CF is to have a robust, interconnected, and integrated C4ISR capability in support of decision-making. Figure 6 provides an overview of TIM08 components.

[58] *Canadian Forces C4ISR Command Guidance & Campaign Plan. Spiral 3 Execution,* dated 17 November 2004.
[59] *Canadian Forces Command Decision Support Capability - Principles & Goals* (2003-09-03)

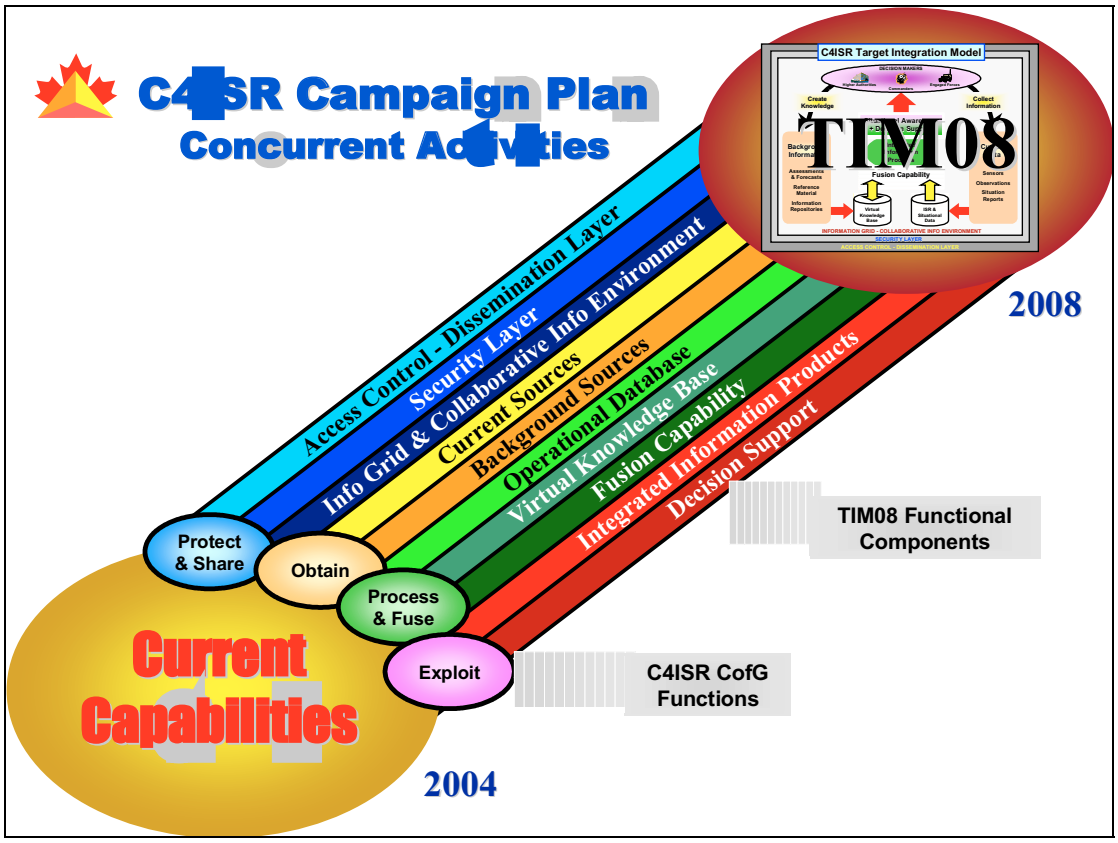

Figure 6 – Target Integration Model 2008 (TIM 08)

The components and capabilities of TIM13 have not yet been fully defined. It is expected that the capabilities created by TIM08 will be further developed and integrated to allow more sophisticated use of NEOps, including the connection/integration of key national security partners. Processes to incorporate space-based sensing, improved sensor-to-shooter linkages, and the use/incorporation of wireless broadband networks are expected to be included. Much more emphasis on the changes required to allow distributed decision-making and self-synchronization in the context of Commander's intent will be required. Those responsible for the C4ISR campaign plan will need to integrate their work much more closely with those responsible for organisational aspects, logistics, concept development and experimentation, etc., as well as work closely with the personnel responsible for implementing NEOps.

10.2.2 Defence Information Management Strategy 2020

The recently published Defence IM Strategy's[60] key point is that an "Enterprise Approach" to Information management is essential to future mission success. Its vision is: "An Information Age transformation enabling an Integrated Knowledge Environment (IKE) that optimizes Defence capabilities". The IM Strategy is based on a framework involving three portfolios: the Military (e.g., command decision support systems, sensor systems, weapons (control) systems), the Corporate (e.g., enterprise resource planning systems, corporate management systems, and functional management systems), and the Common Portfolio. The latter "will include the transport, network, security and service systems and policies necessary to deliver the *robust network-enabled capability* sought by all members of the Defence community." All three portfolios are required to support operations. The concept for the Defence IM Strategic Plan

[60] This document can be found on the DWAN Website at: http://img.mil.ca/ADM_IM/documents/DIMS2020_e.htm

involves three overlapping phases that are aligned with the Departmental planning horizons. The focus of these three phases is to create a single, fully integrated, system of systems that will be a robust, secure, survivable and responsive network.

As mentioned in Section 3.4, there is a requirement to establish the Force Generation and Effective Engagement JCATs. Once this is accomplished, both the *C4ISR Campaign Plan* and *Defence Information Strategy 2020* would be greatly facilitated by coordination with the four JCATs. This will maximize the benefit from the increasing connectivity and information management capability.

Recommendations:

a. Increase the harmonization between the C4ISR Campaign Plan and the ADM (IM) Defence Information Management Strategy 2020 with future NEOps Human Dimension, CD&E and operational effectiveness Campaign Plans as these are developed; and

b. Adjust the implementation of tangible products of both the C4ISR Campaign Plan and the Defence Information Strategy 2020 to meet the requirements of the new CF Command structure including the new Joint Staff, Canada Command, Canadian Expeditionary Force Command and Regional and operational task forces.

10.3 Integrating DND's Science and Technology NEOps Efforts

DRDC is in a strong position to support the evolution of NEOps. The Centre for Operational Research and Analysis and the Human Research division of DRDC Toronto are two important examples. Three of DRDC's formal programs are well positioned to support the evolution of NEOps. The first is the TDP that demonstrates technologies fostered by DRDC and Canadian industry in the context of real and potential future CF capabilities, concepts, doctrine, operations, and equipment.[61] It is envisaged that the TDP will make valuable contributions to building NEOps technological capacity, including in the area of security. The second and third programs are research focussed. The first of these is the Science and Technology Strategy. DRDC is fully aware of the dual challenges of exploiting the opportunities offered by the Information Age and the very real threats from asymmetric warfare. DND, with strong input from the military, focuses its S&T Strategy on future R&D capabilities in critical technology areas where it can make a difference. Allies and national partners' R&D programs are leveraged to provide the additional capabilities needed to carry out a defence R&D program that responds to the Capability Goals of the CF.[62] The S&T Strategy should be used to support the building of NEOps capacity on all three axes. Finally, the Technology Investment Fund (TIF) is a high risk, high payoff research vehicle that could make important contributions to the more advanced, further-out aspects of NEOps. DRDC has been leading the development of the TTCP five-country (CA, US, UK, NZ, AS) Network Centric Warfare R&D Strategy and is thus well placed to contribute to the Canadian NEOps implementation.

[61] Technology Demonstration Program Website: http://www.drdc.gc.ca/business/tdp/tdp_e.asp
[62] Technology Investment Strategy Website: http://www.drdc.gc.ca/researchtech/tis/intro_e.asp

Recommendation: Optimize TDP Projects for their relevance to NEOps and ensure that the DND's S&T Strategy and Technology Investment Fund programs make strong contributions to the implementation of NEOps. Ensure leveraging of Allies' NEOps R&D efforts.

10.4 National and International Interoperability Considerations

Ongoing defence planning indicates that the CF will become more integrated but maintain their environmental specialties (see Figure 7). Clearly the designers of future networks will have to keep in mind the planned evolution of the CF over the next 10 years as they build the networks of the future. In addition, they must remain abreast of similar developments in other jurisdictions that could affect interoperability, including those associated with:

a. OGDs;

b. NGOs;

c. allied countries, particularly US, UK, and Australia;

d. NATO countries; and

e. key multinational forums such as the Multinational Interoperability Council (MIC).

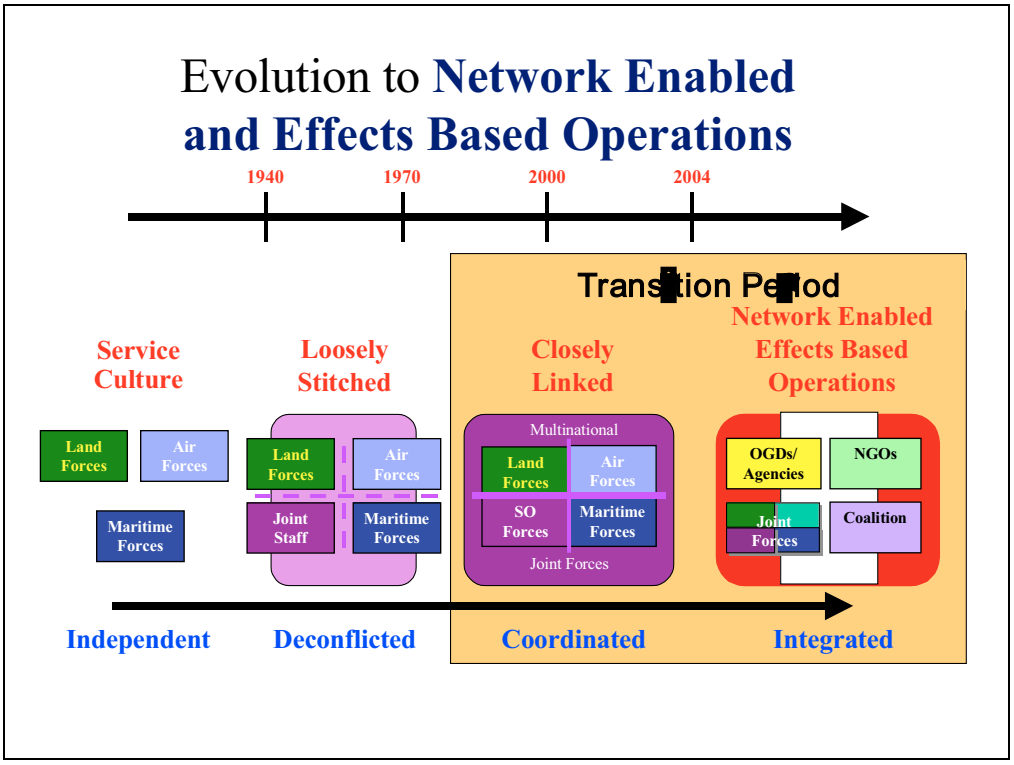

Figure 7 – Integration of CF

The principles lain out in the *Defence Policy Statement*, *National Security Policy* and developing defence policy will drive interoperability considerations. While integration with the Government Operations Centre will demand that a range of technical solutions are developed and

implemented as a matter of national policy (i.e. common data standards, data links, networking and security standards, etc), there remains a requirement to harmonize strategic capabilities between government departments and NGOs. Furthermore, to facilitate interoperability, there is a requirement for increased exchange of personnel between these organizations.

In relation to international allies, the CF may adopt international data standards such as those developed by NATO to ensure interoperability outside of Canadian borders. As a minimum, the CF needs to be able to exchange data with its allies.

Recommendations:

a. Develop policies and procedures for the adoption and implementation of data standards to enhance future national and international interoperability; and

b. Develop information exploitation policies, standards and procedures.

10.5 Network Enabled Logistics

The key issue for Logistics, Maintenance, Engineering, Health Support and Personnel Support services that collectively sustain CF operations is that, as the CF gradually progresses from a platform-centric to a more network-centric environment, logisticians[63] must also be included as an integral element of the sensor, decision-maker and shooter network. As systems and processes are developed to enable the fielding of a comprehensive COP, there must be support layers built into it so that logisticians have sufficient access to information to permit more proactive, agile support service delivery.

Support services have become increasingly reliant upon Enterprise Resource Planning and other IM/IT systems, sophisticated software applications and more powerful communications networks to enable support transactions, databases, reach-back support and planning activities. The full operational deployment of these systems has been constrained by bandwidth limitations in distant operating areas. To resolve these constraints, planners and decision-makers must ensure that the proliferation of stove-piped systems are rationalized and techniques adopted to limit the strain on forward bandwidth and computer processing capacity.

The same technological advances also make possible the adoption of leading-edge support processes pioneered in the commercial/industrial sector. This creates the potential for transformational changes in such military support services as supply chain and transportation management (i.e. in-transit and asset visibility), health services and equipment maintenance (i.e. pro-active diagnostics), and personnel welfare services (i.e. internet services to connect with families back home). The possibility of reducing the traditional large sustainment footprint in distant theatres of operation will increase, thereby enhancing the CF's expeditionary capability and operational agility. To achieve the potential transformational advances in support capability will require a thoughtful appraisal of how these technologies can be applied to support operations

[63] Logistician, in this usage, is intended to explicitly include maintenance, engineering, health support and personnel support services.

without creating a bandwidth and data processing burden. Additionally, provision must be made in the limited CF capital budget for smart investments in these advanced support technologies.

Support personnel are accustomed to work within CF/DND-wide support systems so they are generally attuned to thinking of support systems. Their training and culture must increasingly cause a shift away from a linear, echeloned way of thinking and acting to a more sophisticated, network-centric approach.

10.6 Security and Privacy Implications

NEOps potentially has a range of security and privacy implications, from how and with whom information will be shared to how it will be classified in aggregate. It is also possible that personnel will require higher levels of security clearance, thereby potentially affecting the efficiency of the security clearance program. Accordingly, there is a requirement to develop a clearer understanding of how NEOps will affect security and privacy considerations and to work towards developing acceptable solutions.

Recommendation: Conduct a study to identify the security and privacy implications of NEOps and initiate work to develop appropriate solutions.

10.7 Rapid Capability Generation and Insertion

The development of NEOps capability must take advantage of the information available through networks and ensure flexibility and timeliness in capability delivery. The CapDEM TDP Project (Capability Definition Engineering & Management) has been establishing relevant tools and processes to advance the DND/CF capability development ability. However, as experienced by our allies, responsive delivery of capability requires a capacity for Rapid Prototyping and Development, and Rapid Acquisition. Such an approach would ensure fast cycles, with small development components; early visualization of the product; clear definition of initial requirements; early user testing and continued user development; enhanced communication within the development organization; streamlined procedures for fielding new capabilities; and enhanced feedback to users and stakeholders. Therefore, in order to best take advantage of technological advances, DND/CF needs to develop the capacity for rapid capability generation and insertion.

Recommendation: Building on the work of the CapDEM TDP project and relevant work of our closest Allies, determine the requirements and process for setting up the ability for DND/CF NEOps Rapid Capability Generation and Insertion.

10.8 Role of Industry

Many network, software, security, and computer technological advances important to NEOps development will be generated by industry. DND/CF must develop an approach to exploit and leverage these advances. Industry should also be considered as the key system integrator for the establishment of key NEOps capabilities when a 'systems-of-systems' approach is required. This could involve assuming the responsibility for engaging and overseeing sub-contractors and ensuring appropriate liaison with NEOps stakeholders, defence industry in other countries, and government departments and agencies. Governmental policies restricting such interaction between DND/CF and industries should be examined for possible amendment.

All aspects of logistical support must happen much more quickly in the future, therefore, new agreements will be required to facilitate rapid, network-based, vendor support and maintenance for materiel. For the latter this would mean that deployed technicians would have the ability to obtain real or near-real time assistance via the network to resolve equipment problems.

Recommendations:

a. Carry out a study to determine the role that industry should play in implementing a sophisticated NEOps approach, which should address the role of industry as a key system integrator for key NEOps capabilities and in providing maintenance for materials and equipment in a NEOps environment; and

b. Carry out a study to identify what government policies need to be changed in order to allow integration, as appropriate, by industry with DND/CF in order to support NEOps development and operations.

11.0 NEOps Governance and Coordination Office

11.1 NEOps Governance

NEOps is an evolving concept that needs to be guided and supported by senior level managers in DND/CF. To that end, it is proposed that the Joint Capability Requirements Board (JCRB), through the Capability Development Working Group (CDWG), be the senior level oversight committee for NEOps. This is a natural extension of their current tasks, which include:

a. providing direction to the capability development process;

b. development of the Strategic Capability Investment Plan (SCIP); and

c. providing direction to and approving the joint Concept Development and Experimentation process.

Recommendation: Defence Management Committee (DMC) direct that JCRB, through the CDWG, serve as the NEOps oversight committee.

11.2 Establishment of a NEOps Coordination Office

Currently, there are no resources dedicated to coordinating an integrated NEOps approach. The NEOps Symposium Working Group has fulfilled its mandate by producing a NEOps Working Paper, organizing a major symposium and workshops and producing this working document. A NEOps Coordination Office staffed with full time personnel is essential if further implementation of NEOps is to be achieved. This office will require the resources and mandate to coordinate the ongoing evolution of NEOps within DND/CF, ensure that there is an integrated approach to NEOps across traditional lines of authority, that stovepipe solutions incapable of supporting an integrated approach to operations are avoided, and to provide NEOps-related advice and guidance. The NEOps Coordination Office should be organizationally positioned so that it is a key part of the transformation and force development processes.

Recommendation: Form a NEOps Coordination Office under the VCDS and make it a key part of the future force development and transformation processes.

12.0 Resourcing the Roadmap

Establishing an advanced NEOps capability will require senior decision makers to embrace NEOps and provide adequate funding. Synergies can be achieved by coordinating currently approved projects and ensuring that these are delivered "net ready".[64] The SCIP already contains numerous projects that relate to NEOps. As transformation proceeds, it is also more essential than ever to have a closely integrated, responsive, and networked corporate infrastructure program.

Recommendation: Carry out a detailed analysis of the SCIP and other departmental initiatives to ascertain which projects could become part of an integrated approach to establishing an advanced NEOps capability. Consider which projects need to be modified to ensure that they are "net ready' when completed.

13.0 Refining the Roadmap

Transforming DND/CF and establishing an advanced NEOps force will require a synchronized capability approach to NEOps. The ability to regularly update the NEOps roadmap is critical as lessons are learned and the security environment and Canada's strategic direction changes. Canada needs to work closely with its Allies and NATO in continuing to implement NEOps and transformation. In order to achieve its transformation objectives, DND/CF must use its existing and evolving NEOps capability to share information, coordinate and self-synchronize its efforts among all of its military and support organizations.

[64] In this instance, for information technology systems to be "net ready" refers to ensuring their compliance with governmental and departmental standards that may evolve as the result of NEOps. In support of such a goal, ADM (IM) has begun development of a Concept of Operations to determine whether a project is NEOps relevant.

IV. CONCLUSIONS

Although the CF is, in many ways, already a networked force, much greater connectivity, more advanced information handling and collaborative tools, and a much greater emphasis on the human aspects of NEOps are required. Experience gained while working with NEOps will influence how it will be implemented. A significant number of DND/CF individuals and organizations are familiar with NEOps principles and the approaches taken by our Allies. However, a common understanding is required of how NEOps applies to the CF, integrated service operations, the DND support organizations, and the national '3D' communities. Future interoperability with international security partners must also be addressed.

This document is the first iteration of the Canadian NEOps Concept and Roadmap. A series of recommendations are made which are designed to facilitate an enterprise-wide, integrated approach. A synchronized capability approach to NEOps is envisaged, whereby capacity is built along three axes: People, Processes and Technology. Among the high-priority recommendations in this document are:

- The creation of a NEOps Coordination Office
- Adopt an accelerated learning by doing approach to the operationalization of the NEOps concept
- An enterprise-wide approach (to include our '3D" security partners) to connectivity, information management and collaboration
- Optimize existing and establish new exchange and liaison programmes with all appropriate security partners
- Development of a Canadian NEOps Human R&D program
- Creation of a NEOps Recruitment, Education, Training, and Retention Campaign Plan
- A "whole-of-country" debate and agreement on NEOps capabilities with national security partners
- Development of a comprehensive Canadian NEOps Concept Development and Experimentation, as well as a focussed, integrated NEOps R&D Program.
- Development of an ability to rapidly insert NEOps capabilities
- Integration of the supply, sustainment and mobility functions across the NEOps environment

A series of studies and analysis should also receive high priority. Included are:

- Command, control and commander's intent in a NEOps environment, including the decentralization of decision-making
- The efficiency of agile teams in a NEOps environment
- The cultural change required to transform to a CF empowered by NEOps

- The inculcation and maintenance of trust required for decentralized decision-making and self-synchronization
- The skills and competencies required in a NEOps environment, as well as how to retain trained NEOps personnel
- The security implications of NEOps

The rapid advancement of NEOps is critical to enable the vision of the *National Security Policy*, *International Policy Statement Overview* and *Defence Policy Statement*. Without this initiative, the close integration and effective teaming of the CF and the Canadian security and 3D communities, as well as future interoperability with our Allies would be in serious jeopardy.

Annex A – Summary of Recommendations and Actions

This working paper contains many actions and recommendations that provide a start point from which DND/CF can commence enhancing its current NEOps capability. The recommendations and actions from the body of the document are re-produced below, and the OPI(s)/OCI(s) are listed. In addition, they have been grouped according to category (implement, develop or study). Finally, a Rough Order of Magnitude costing for the resources required to implement each recommendation has been provided.

Recommendation	Category	Resources	OPI(s)	OCI(s)
Institute a three-axes approach to building the future NEOps Force consisting of People, Processes and Technology.	Implement	None	JCRB	
Adopt a "learning by doing" approach to the operationalization of the NEOps concept.	Implement	None	VCDS	All L1s
DMC direct that JCRB, through the CDWG, serve as the NEOps oversight committee.	Implement	No new resources required – add requirement to JCRB and CDWG responsibilities.	DMC	
Form a NEOps Coordination Office and make it a key part of the future force development and transformation processes.	Implement	See Annex A Appendix 1	VCDS	DCDS ADM (S&T)
Establish a Canadian NEOps Human R&D program. (This program should be given high priority, be tightly coupled with operational priorities and training/education functions, and be closely integrated with CD&E and the NEOps Coordination Office).	Implement	To be determined.	ADM (S&T)	VCDS DCDS ECSs
Initiate a Canada-wide discussion on NEOps with other partners, both inside and outside government.	Implement	Conduct a Strategic Level Symposium. 3 PYs and O&M Budget of $200K (could be shared among several government departments).	VCDS	DCDS ADM (S&T) ADM (Pol)
The CFEC and the Environmental CD&E Centres should establish an integrated NEOps CD&E approach to evaluate the effectiveness of concepts and help	Implement	No new resources required at present. Make use of existing mechanisms to develop Plan	DCDS ECSs	VCDS

Recommendation	Category	Resources	OPI(s)	OCI(s)
generate the policy, doctrine and TTPs required by the Future Force. This program should leverage Allies' and NATO CD&E efforts.		Pegasus and Environmental CD&E Centre Plans.		
Create a DND/CF Centre of Excellence for the Human in Transformation. Ensure that all key players, such as ADM (HR-Mil), ADM (HR-Civ), AMD (IM), ADM (S&T), VCDS, DCDS, and the ECSs, have direct input and representation.	Implement	5*PYs $1.5M annually O&M	ADM (HR Mil) ADM (HR Civ) ADM (IM) VCDS DCDS ECSs ADM (S&T)	
Carry out a detailed Operations Research analysis of Canada's key Strategic Documentation to derive a picture of organizational aspects of the Future Force and to delineate more closely the requirements for networking.	Implement	No new resources required, re-focus existing resources.	VCDS	
Conduct an Operations Research analysis to define the requirement for a NEOps approach between DND/CF and its diplomatic, security, and development partners.	Implement	No new resources required, re-focus existing resources.	VCDS ADM (Pol)	
Ensure that the results of the TTCP Study on R&D of the cognitive and social domains are used to advance NEOps in Canada.	Implement	No new resources required, re-focus existing resources.	ADM (S&T)	
Expedite the establishment of the Force Generation and Effective Engagement Joint Capability Assessment Teams (JCATs) in order to be able to take a holistic, collaborative approach to NEOps and other key transformational aspects.	Implement	No new resources required, reorganize existing matrix staff.	VCDS ADM (HR Mil)	DCDS ECSs
The JCATs shall identify and prioritize the resolution of capability deficiencies, leading to the development of policy, doctrine and TTPs for the future NEOps Force	Implement	No new resources required, reorganize existing matrix staff.	VCDS JCATs	DCDS ECSs

Recommendation	Category	Resources	OPI(s)	OCI(s)
by functional authorities (Level 1s). This work will be facilitated by the analysis done in support of the Working Paper for the NEOps Symposium				
Establish synergies between policy, doctrine and TTP production and the NEOps CD&E Program.	Implement	No new resources required, reorganize existing matrix staff.	VCDS DCDS	ECSs
Increase the harmonization between the C4ISR Campaign Plan and the ADM (IM) Defence Information Management Strategy 2020 with future NEOps Human Dimension, CD&E and operational effectiveness Campaign Plans as these are developed	Develop	No new resources required, re-focus existing resources.	ADM(IM) ADM (HR Mil&Civ) DCDS ADM (S&T)	
Develop a comprehensive human NEOps CD&E program coordinated with all of the key DND/CF stakeholders.	Develop	No new resources required, re-focus existing resources.	ADM (HR Mil) DCDS	ADM (S&T) ECSs
Optimize TDP Projects for their relevance to NEOps and ensure that DND's S&T Strategy and Technology Investment Fund programs make strong contributions to the implementation of NEOps. Ensure strong leveraging of Allies' NEOps R&D efforts.	Develop	No new resources required, re-focus existing resources (ensure that NEOps Coordination Office is aware of TDP, TIS and TIF developments).	ADM (S&T)	DCDS VCDS
Adjust the implementation of tangible products of both the C4ISR Campaign Plan and the Defence Information Strategy 2020 to meet the requirements of the new CF Command structure including the new Joint Staff, Canada Command, Canadian Expeditionary Force Command and Regional and operational task forces.	Develop	No new resources required, address this recommendation during the next scheduled re-write of these documents.	ADM (IM)	DCDS
Develop a NEOps Recruitment, Education, Training, and Retention Campaign Plan.	Develop	No new resources required, re-focus existing resources. A high priority task for the Force Generation JCAT.	ADM (HR Mil & Civ) VCDS	ECSs
Develop general awareness and familiarity training on NEOps and the issues involved for current military and civilian staff. This could be in the form of an e-course.	Develop	No new resources required, re-focus existing resources. A high priority task for the Force	ADM (HR Mil & Civ)	ECSs

Recommendation	Category	Resources	OPI(s)	OCI(s)
Included in this should be staff officers, acquisition staff and policy makers.		Generation JCAT.		
Develop a NEOps educational program, which will be integrated into Canada's military/training instit-utions, that identifies the importance of information sharing and develops the required information-centric culture. A purposeful, coherent strategy and implementation plan for the development of NEOps individuals must be part of this program.	Develop	No new resources required, re-focus existing resources. A high priority task for the Force Generation JCAT.	ADM (HR Mil & Civ)	ECSs
Carry out a detailed analysis of the SCIP and other departmental initiatives to ascertain which projects could become part of an integrated approach to establishing an advanced NEOps capability. Consider which projects need to be modified to ensure that they are 'net ready' when completed.	Study	0.5 PY (NEOps Coordination Office)	VCDS DCDS ADM (Mat)	
Carry out a study on the nature of trust in NEOps and how trust can be inculcated and maintained in decentralized decision-making and self-synchronization.	Study	1.0 PY. A task for the Canadian NEOps Human R&D Program	ADM (HR Mil) ADM (S&T)	
Optimize existing DND and CF exchange and liaison programmes, and consider the establishment of new programmes across the full range of our security partners.	Implement	None	VCDS	All L1s
Carry out a detailed study, leading to experimentation, of collaboration in a NEOps environment and the efficiency of agile groupings (or ad-hoc teams) under various scenarios, including active military conflict.	Study	1.0 PY. A task for the Canadian NEOps Human R&D Program and CFEC	ADM (HR Mil) ADM (S&T)	
Conduct a detailed study on the significant issues of command, control and commander's intent in a NEOps environment. This study should establish how much decentralization of decision making is possible, the conditions for this to happen and the limitations of	Study	1.0 PY. A task for the Canadian NEOps Human R&D Program	ADM (S&T) ADM HR (Mil)	DCDS ECSs

Recommendation	Category	Resources	OPI(s)	OCI(s)
decision making at various levels.				
Develop policies and procedures for the adoption and implementation of data standards to enhance future national and international interoperability.	Study Develop Implement	.3 PY	ADM (IM)	Other L1s
Develop information exploitation policies, standards and procedures.	Study Develop Implement	.3 PY	ADM (IM)	Other L1s
Develop future support concepts in the Sustain and Mobility capability areas to address the implications and significant potential of NEOps for the transformation of support capabilities and to ensure their co-evolution with the NEOps Force.	Study	0.3 PY	ADM (Mat)	
Building on the work of the CapDEM TDP project and relevant work of our closest Allies, determine the requirements and process for setting up the ability for DND/CF NEOps Rapid Capability Generation and Insertion.	Study	0.4 PY	ADM (Mat) ADM (S&T)	
Carry out a study to determine the role that industry should play in implementing a sophisticated NEOps approach, which should address the role of industry as a key system integrator for key NEOps capabilities and in providing rapid support for materials and equipment maintenance in a NEOps environment.	Study	0.3 PY	ADM (Mat)	VCDS DCDS
Carry out a study to identify what government policies need to be changed in order to allow integration, as appropriate, by industry with DND/CF in order to support NEOps development and operations.	Study	0.3 PY	ADM (Mat)	VCDS DCDS
Carry out an interdepartmental/interagency analysis of the cultural aspects of the Canada Command and Team Canada approaches to future operations enabled by NEOps and determine what could be done to facilitate the required cultural change.	Study	0.5 PY. A task for the DND/CF Centre of Excellence for the Human in Transformation.	ADM (HR Mil) ADM (S&T)	

Recommendation	Category	Resources	OPI(s)	OCI(s)
Initiate studies on: the identification of skills and competencies required in a NEOps environment; the development of a profile to find, filter and attract the right people; and, the recruitment and military training of people above entry level with the right, highly developed, cognitive and social skills to operate in a NEOps environment.	Study	1.0 PY. A task for the DND/ CF Centre of Excellence for the Human in Transformation.	ADM (HR Mil) ADM (S&T)	
Carry out a study to find ways to enhance the retention of people with highly desirable NEOps abilities and facilitate the movement (deployment) of those who do not have the requisite skills to remain in a NEOps environment.	Study	0.3 PY. A task for the DND/CF Centre of Excellence for the Human in Transformation.	ADM (HR Mil & Civ)	
Conduct a study to identify the security and privacy implications of NEOps and initiate work to develop appropriate solutions.	Study Develop Implement	No new resources required, re-focus existing resources.	ADM(IM) VCDS DPM Secur	Other L1s

NEOps Coordination Office

Background

The Office will be staffed by military and civilian personnel and contract positions. There will be sufficient money in the O&M Budget to hire Consultants. Ideally, personnel selected to work in the office and the consultants hired to assist with the work of the Office would be familiar with Strategic Planning, Transformation in DND/CF and have a good understanding of the underlying principles of the NEOps Concept.

Positions

1. OIC	Col/Capt(N)
2. S&T Staff Officer	DS 5
3. OR Analyst	DS 5
4. VCDS Representative	LCol/Cdr
5. DCDS Representative	Maj/LCdr
6. HR Representative	Maj/LCdr or Civilian Equivalent
7. ADM (IM) Representative	Maj/LCdr or Civilian Equivalent
8. ADM (Mat) Representative	Maj/LCdr or Civilian Equivalent
ADM (IE) Representative	Matrix Support
ADM (Fin CS) Representative	Matrix Support
ADM (PA)	Matrix Support
Procurement Officer	PM 4 (could be shared with other Projects)
CMS	Formal POC only
CLS	Formal POC only
CAS	Formal POC only

NEOps Coordination Office Estimates			($CY 000)				
Recurring (3 years)				**Non_Recurring**			
P Costs				**Capital**			
Mil Salary	6	$ 90.0	$ 540.0				
Civ Salary	2	$ 100.0	$ 200.0				
Sub-total Annual			$ 740.0	Internet PC	8	1.5	12
				Laptops (w Docking station)	8	4	32
				BW NW Printer	1		3
O&M Costs				Colour NW Printer	1		6
Consultants			$ 200.0	Furniture	8	3.3	26.4
TD			$ 80.0				
Tel Svcs	8	$ 0.1	$ 0.8	**Non Recurring (Other)**			
Translation		$ 10.0	$ 10.0	Symposium			150
PP&S		$ 2.5	$ 2.5	Non Recurring Sub-Total			229.4
Sub-total Annual			$ 293.3	Contingency 10%			22.94
Recurring Total			**$1,033.3**	**Non Recurring Total**			**252.34**

ANNEX B – LIST OF ACRONYMS AND ABBREVIATIONS

Abbreviation	Term
3D	Defence, Diplomacy and Development
ADF	Australian Defence Force
ADM (HR-Civ)	Assistant Deputy Minister Human Resources, Civilian
ADM (HR-Mil)	Assistant Deputy Minister Human Resources, Military
ADM (IM)	Assistant Deputy Minister Information Management
ADM (Mat)	Assistant Deputy Minister Materiel
ADM (Pol)	Assistant Deputy Minister Policy
ADM (S&T)	Assistant Deputy Minister Science and Technology
AU	Australia
C2	Command & Control
C4ISR	Command, Control, Communications, Computer, Intelligence, Surveillance & Reconnaissance
CA	Canada
Canada COM	Canada Command
CapDEM	Capability Definition Engineering and Management
CD&E	Concept Development and Experimentation
CDS	Chief of the Defence Staff
CDWG	Capability Development Working Group
CF	Canadian Forces
CFEC	Canadian Forces Experimentation Centre
COD	Common Operational Dataset
COP	Common Operating Picture
CP	Campaign Plan
DCDS	Deputy Chief of Defence Staff
DGSP	Director General Strategic Planning
DM	Deputy Minister (National Defence)
DMC	Defence Management Committee
DND	Department of National Defence
DoD	Department of Defense (United States)
DRDC	Defence Research and Development Canada
ECS	Environmental Chiefs of Staff
FFH	Fast Frigate Helicopter
GCCS – M	Global Command and Control System – Maritime
GIG	Global Information Grid
HQ	Headquarters
HR	Human Resources
IKE	Integrated Knowledge Environment
IM	Information Management
ISR	Intelligence, Surveillance and Reconnaissance
ISSP	Integrated Soldier System Project
ISTAR	Intelligence, Surveillance, Target Acquisition and Reconnaissance
JCATs	Joint Capability Assessment Teams
JCRB	Joint Capabilities Requirements Board
JIMP	Joint, Interagency, Multinational and Public
Los	Liaison Officers
LSI	Lead System Integrator
MIC	Multinational Interoperability Council
MND	Minister of National Defence
NATO	North Atlantic Treaty Organization

Abbreviation	Term
NBD	Network Based Defence (Sweden)
NCO	Network Centric Operations (United States)
NCW	Network Centric Warfare (United States & Australia)
NEC	Network Enabled Capability (United Kingdom)
NEOps	Network Enabled Operations
NERS	National Emergency Response System
NGO	Non-Governmental Organization
NITEworks	Network Integration Test and Experimentation Works
NNEC	NATO Network Enabled Capability
NSP	National Security Policy
NZ	New Zealand
OGD	Other Government Department
OR	Operations Research
PRICIE	Personnel, Research and Development / Operational Research, Infrastructure and Organisation, Concepts, Doctrine and Collective Training, Information Technology Infrastructure, and Equipment, Supplies and Services
PSEPC	Public Safety and Emergency Preparedness Canada
PY	Person Year
R&D	Research and Development
RCIC	Rapid Capability Insertion Capability
RMC	Royal Military College
RMP	Recognized Maritime Picture
SCIP	Strategic Capability Initiatives Plan
SIREQ	Soldier Information Requirements
SSM	Sustain, Support and Mobility
S&T	Science and Technology
SWG	Symposium Working Group
TDP	Technology Demonstration Program
TIF	Technology Investment Fund
TIM 08	Target Integration Model 2008
TIMs	Target Integration Models
TIS	Technology Investment Strategy
TTCP	The Technical Cooperation Program
TTPs	Tactics, Techniques and Procedures
UAVs	Uninhabited Aerial Vehicles
UK	United Kingdom
US	United States of America
USN	United States Navy
VCDS	Vice Chief of the Defence Staff
WMD	Weapons of Mass Destruction

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4. AUTHORS

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14. ABSTRACT

DND and the CF have been thinking about Network Enabled Operations (NEOps) for a number of years. The aim of this working paper is to assist in the development of an integrated, coordinated way ahead on NEOps by setting out a common understanding of this concept, highlighting its scope, benefits and implications, and providing a notional roadmap to exploit its potential. The implementation of NEOps across DND and the CF will evolve further as the capabilities required to implement the Defence Policy Statement are further defined in the forthcoming Defence Capabilities Plan and other Departmental policy and planning documents.

15. KEYWORDS, DESCRIPTORS or IDENTIFIERS

Network Enabled Operations
NEOps
Network Centric Warfare
NCW
3 D
Defence Diplomacy and Development

Defence R&D Canada

Canada's leader in defence
and national security R&D

R & D pour la défense Canada

Chef de file au Canada en R & D
pour la défense et la sécurité nationale

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