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RCAF C4ISR: AT A TURNING POINT

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What enables the wise sovereign and the good general to strike and conquer, and achieve things beyond the reach of ordinary men, is foreknowledge.

—Sun Tzu, The Art of War

INTRODUCTION

In the last 20 years, exponential growth in computing power has changed how modern society interacts. This technological revolution has also affected military forces, which have needed to adapt to this leap into the information age. Nowhere has this been more evident than in the C4ISR domain (Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance) because of its heavy reliance on technology. The Canadian Armed Forces (CAF) recognize the need to adapt its approach to C4ISR and they have charted a course with a new C4ISR Strategy, Vision, and Goals document that provides the intent for the organization to meet this challenge. The Royal Canadian Air Force (RCAF) is at a technological crossroad, and it must decide how it will embrace this opportunity for change in its C4ISR enterprise. Since much research has been done in the field of organizational change, it can be useful to examine how these principles can be applied to the dilemma faced by the RCAF today. This paper will thus use organizational change theory as a backdrop to examine how the RCAF can embrace the required change effort in the C4ISR enterprise.

First, the concept of C4ISR will be explained to provide the reader with an understanding of what it entails for military operations. Then the world of C4ISR will be examined to explore the various aspects that pose significant challenges to effective integration on the modern battlefield. After introducing organizational change theory, the next section will explore what two of Canada's closest allied Air Forces, the United States (U.S.) and Australia, have done to progress their C4ISR enterprise. To bring this analysis in the Canadian context, the paper will then examine what has been done to date in the C4ISR domain in the CAF and RCAF.

Finally, by using organizational change models as a tool and by drawing recent lessons from our closest allies, the final section will make high level recommendations on how the RCAF can chart a course to move its C4ISR enterprise forward in the rapidly evolving technological environment.

C4ISR DEFINED

The basic premise of C4ISR is to leverage the synergy and interconnection of people, technology, and processes to provide the Commander with accurate and timely information to achieve decision superiority.[1] To provide an understanding of C4ISR it is useful to isolate and analyze its separate components, while keeping in mind that C4ISR is only effective when all components are working tightly together. The first two Cs represent the Command and Control (C2) aspect of the process relating to the Commander's ability to understand the information provided to make informed decisions and communicate his intent to direct operations. The next two Cs are Communications and Computers, which relates to the communication and information systems (CIS) used to get the gathered information from the sensors to the Commander or warfighter. This is the backbone of C4ISR; it comprises all communication links across various systems, as well as the exploitation systems themselves. The I stands for Intelligence, the process of analyzing collected data to make deductions and interpretations resulting in information products made available to the Commander to enable the decision making process. Finally, S and R entail the activities of Surveillance and Reconnaissance of enemy forces to gather data and observe its actions. Reconnaissance implies a wide "search for

[1] Lt Gen David A. Deptula, "Intelligence, Surveillance, and Reconnaissance in the Information Age," *Leading Edge Airpower*, (9 June 2015), https://leadingedgeairpower.com/2015/06/09/intelligence-surveillance-and-reconnaissance-in-the-information-age/.

data and information about a target or area of interest," while Surveillance translates into a more persistent monitoring function akin to a police stakeout.[2]

Another concept that is often used while talking about C4ISR is the Processing Exploitation and Dissemination (PED) function. PED is the activity where data and information provided by the sensors is processed and exploited then disseminated to decision makers at all levels. Through the PED process, the intelligence product must arrive at the appropriate time and with enough interpretation to be useful to the Commander or warfighter.

C4ISR is therefore the all-encompassing grouping of a system of systems that must work seamlessly to enable decision superiority by providing the right information, at the right time, to the right person. When we relate C4ISR to the kill-chain concept of "find, fix, track, target, engage, assess" it is obvious that C4ISR is part of most of these steps and hence C4ISR activities are operations in themselves, not just supporting operations as was previously conceptually accepted.[3]

THE PROBLEM WITH C4ISR

Before the advent of modern computers, the collection of information and its transformation into an intelligence product was a slow, methodical process. Until recently, the intelligence environment was a very specific domain with dedicated resources, such as the U-2 aircraft, being used to collect specific information about an area or a designated target. As computing power increased and sensors miniaturized, new systems were developed that could be used on a variety of non-traditional intelligence platforms and that could relay their information

[2] Department of National Defence. B-GA-402-000/FP-001, *Canadian Forces Aerospace Sense Doctrine*, (Winnipeg: Commander 2 Canadian Air Division /Air Force Doctrine and Training Division, August 2012), 30.

[3] Lt Gen David A. Deptula Intelligence, "Surveillance, and Reconnaissance in the Information Age," *Leading Edge Airpower*, (9 June 2015), https://leadingedgeairpower.com/2015/06/09/intelligence-surveillance-and-reconnaissance-in-the-information-age/.

to the commander or even directly to the warfighter in real-time or near real-time (NRT).[4] As those capabilities were fielded, individual militaries and services within them acquired their own systems to suit their individual needs. These systems were not designed with a common architecture and therefore, present day armed forces, such as the CAF, are left with a variety of disparate systems that are not easily interoperable. A compelling RCAF example of this phenomenon can be observed in the various incompatible tactical data link (TDL) systems fitted to RCAF aircraft that have traditionally not worked together:[5]

> "The RCAF currently operates only three air assets capable of TDL: the CF-188 has Link 16 while the CP-140 operates Link 11. The CH-124 Sea King has a locally created ad hoc TDL capable of linking with select RCN assets. Both Link 16 and Link 11 standards are not compatible unless a common interface is remotely used to fuse the information and create a recognized air picture (RAP). The Hornet cannot exchange Link 16 data with the Aurora and neither of them can exchange TDL data with the army. The Sea King can only link with a few RCN assets. Even the CF-18's version of Link 16 is not fully interoperable with coalition partners, since the Link 16 message format was not fully implemented."

What makes this challenge even more daunting is that the technological gap is not limited to different platforms, but also different sensors installed on these platforms. The information collected by the myriad of sensors is not always formatted in a way that can be distributed and used easily across a networked architecture. The CIS network itself must be robust enough to handle a growing amount of data requiring a tremendous bandwidth capacity to cope with multiple sources of imagery and other data intensive products.

Because C4ISR interactions require the participation of many organizations, it does not align well with the traditional boundaries of the separate air, sea, and land environments. This affects a variety of facets such as in the procurement system where each environment is typically

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[4] Department of National Defence, *Canadian Forces Joint Publication 2-7, Joint Intelligence Surveillance, and Reconnaissance*, (Ottawa: DND Canada, 2015), 3-1.

[5] Department of National Defence, *Royal Canadian Air Force, Future Concepts Directive*, (Ottawa: DND Canada, 4 April 2013), 25.

defending its own projects competing for a limited funding envelope. This often leaves C4ISR with no clear leading organization that can champion C4ISR initiatives. Also, since C4ISR links the traditionally separate worlds of intelligence and flying operations, there is still a perceived division within the C4ISR enterprise; the VCDS observed that the "lack of integration between the intelligence and operations process is one area where C4ISR capability is particularly weak."[6]

Finally, another problem with C4ISR is the various and often conflicting understanding of the term by its various players. Often the acronym is broken down in its sub-components or component are added such as target acquisition (TA) which yields new acronyms like ISR, Joint ISR (JISR), C4I, RSTA, or ISTAR that are used interchangeably leading to confusion.[7] The Canadian Army for example uses the term ISTAR in its doctrine even though its definition more closely resembles that of C4ISR.[8] The RCAF refers to ISR in its sense doctrine yet it links it to command and networks which would be better defined as C4ISR since that is exactly what C4 implies.[9] Without agreeing on which term should be used across the services it is difficult to define a way ahead that is inclusive for all players. To this end, it would be useful if all stakeholders in the CAF would agree to use the term C4ISR when talking about any part of the enterprise.

Within this context, C4ISR must evolve into a better optimized system, where all components of the organization must adapt to take advantage of the opportunity from the paradigm shift of the information age. Adapting the C4ISR enterprise can be the catalyst that will

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[6] Department of National Defence, *Vice Chief of Defence Staff, The CAF C4ISR Strategic Vision, Goals and Objectives V1*, (Ottawa: DND Canada, 10 February 2016), 12.

[7] Department of National Defence, B-GL-352-001/FP-001, *Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) Volume 1 – The Enduring Doctrine*, (Kingston: Canadian Army Doctrine and Training Centre, 30 April 2013), vi.

[8] Ibid

[9] Department of National Defence, B-GA-402-000/FP-001, *Canadian Forces Aerospace Sense Doctrine*, (Winnipeg: Commander 2 Canadian Air Division /Air Force Doctrine and Training Division, August 2012), 34.

force the RCAF to embrace this technological shift fully. Using change management principles to frame the challenge of moving C4ISR forward in the RCAF can be useful to evaluate and adjust the approach taken by its senior leadership. Using this framework to explore what other countries and their Air Forces are doing and what approach is favored in each instance provides insights into how the RCAF could instigate and sustain a C4ISR transformation.

CHANGE THEORY

Because the challenge (and opportunity) to the RCAF caused by the required adaptation to the new C4ISR reality will affect it as a whole, it is an organizational change. The "Conceptual Foundations" volume of the "Leadership in the CF" series has identifies a theoretical model that can be used to guide the examination of the direction the RCAF is taking for this organizational change effort.[10] In this volume, the seminal work of Harvard Business School professor John P. Kotter identifies eight critical success factors that can determine if an organizational change effort will succeed. These eight steps are:[11]

1) Establishing a sense of urgency;

2) Forming a powerful guiding coalition;

3) Creating a vision;

4) Communicating the vision;

5) Empowering others to act on the vision;

6) Planning for and creating short-term wins;

7) Consolidating improvements and producing still more change; and

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[10] Department of National Defence, *Leadership in the Canadian Forces: Conceptual Foundations* (Ottawa: Published under the auspices of the Chief of the Defence Staff by the Canadian Defence Academy, Canadian Forces Leadership Institute, 2005), 108.

[11] John P. Kotter, "Leading Change Why Transformation Efforts Fail," *Harvard Business Review* 73, no. 2 (1995): 61.

8) Institutionalizing new approach

Further research by organizational consultant William Bridges has broken down the change process into three distinct phases: endings, neutral zone, and new beginnings.[12] In the ending phase, Bridges points out that it is important to identify why the status quo is no longer acceptable, and help the organization and its members understand that they must let go of the past.[13] The neutral zone is the transition phase where the leadership must listen to concerns emanating from the organization and delineate clear expectations as well as provide resources to help the transition to the next phase.[14] The new beginnings phase is characterized by accepting that things will be done differently, and that these new ways are becoming the new normal. Every member of the organization will not transition through these phases at the same pace; therefore care must be taken to ensure that in the neutral zone, short-term wins are celebrated to facilitate the transition to the next phase.[15]

Finally, an area that cannot be overlooked in organizational change is the political behaviour of various stakeholders when they are struggling for power. David Buchanan, professor of organizational behaviour at De Montfort University in Leicester, conducted extensive research in organizational change politics, and he observed that political maneuvering must be acknowledged and addressed.[16] Power brokers in the change effort yield significant influence that can help or hinder the successful outcome of the desired change. It is therefore important to exert influence early on the opinions of various stakeholders to ensure that political behaviour is controlled from the onset of the change effort.

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[12] William Bridges and Susan Mitchell, "Leading Transition: A New Model for Change," *Leader to Leader* 16, (2000): 31.

[13] Ibid., 34.

[14] Todd D. Jick, "Note on the Recipients of Change," *Harvard Business School* case no. 9491039, (1996): 8.

[15] William Bridges and Susan Mitchell, "Leading Transition: A New Model for Change," Leader to Leader 16, (2000): 31.

[16] David Buchanan and Richard Badham, "Politics and Organizational Change: The Lived Experience," *Human Relations* 52, no. 5 (1999): 625.

CLOSE ALLIES CHANGE TO C4ISR

Although the context of U.S. and Australian Air Forces is slightly different than in Canada, many parallels can be drawn with respect to the challenge of adapting their C4ISR enterprise to the changing technological environment. By doing so, lessons can be identified to help frame the best practices from these two close allies and help pave the path for the RCAF in its approach to the C4ISR challenge.

The U.S. military's edge is based in part on its technological advantage on the battlefield, and as such it has encountered the challenges of the information age ahead of most militaries. To adapt to these new realities, the U.S. Air Force (USAF) approached its C4ISR problem with a fresh new perspective, following many of Kotter's steps to organizational change. The first initiative was to tackle the problem doctrinally; the Air Force Doctrine Document 2-9 was reviewed and revised extensively in 2007 to impart a *sense of urgency* to change how C4ISR was viewed. Building on this doctrinal foundation, the USAF *created a powerful vision*: "a transformational vision of networked and linked sensors that is shrinking the sensor-to-shooter cycle and is giving commanders greater situational awareness and better predictive intelligence necessary to achieve decision superiority and battlefield dominance."[17] Enabled by this vision, the USAF *empowered* its technological leaders to develop the Distributed Common Ground System (DCGS) to connect its multiple intelligence sensors and platforms into a network-centric weapon system.[18] The DCGS was pivotal in enabling the C4ISR vision. To continue

[17] Department of the Air Force, *Air Force Doctrine Document 2-9 Intelligence, Surveillance, and Reconnaissance Operations*, (Washington, D.C.: Secretary of the Air Force, 17 July 2007), ii.

[18] Department of the Air Force, *Air Force Distributed Common Ground System Fact Sheet*, (Washington, D.C.: USAF website, http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104525/air-force-distributed-common-ground-system.aspx.) ; Lt Gen David A. Deptula and Maj Greg Brown, "A House Divided: The Indivisibility of Intelligence, Surveillance, and Reconnaissance." *Air and Space Power Journal*, (Summer 2008).

communicating the change initiative and reinforce the strategic vision, a document entitled "Air Force ISR 2023: delivering decision advantage" was released in 2013. It continued to provide "vision, mission, core tenets, and priorities—that will guide the AF ISR enterprise."[19] To *institutionalize* this re-focus, a complete restructure of its C4ISR enterprise was carried out. This recently re-aligned the entire USAF C4ISR capabilities under the 25th Air Force, moving intelligence assets from the deputy chief of staff ISR to the Air Combat Command, making official the concept that C4ISR is not a supporting, but rather a core operational focus of the USAF in all its operations.[20] Finally, in its latest future operating concept document, the vision of a connected C4ISR enterprise is pushed even further into a concept of a multi-domain Command and Control (MDC2), and a Global Integrated Intelligence, Surveillance, and Reconnaissance (GIISR) that supports the idea that C4ISR "is the foundation upon which every joint, interagency, and coalition operation achieves success."[21] In the last decade, the USAF has carried out this C4ISR transformation convincingly, following many organizational change principles. They have developed a more coherent C4ISR enterprise, with better sensors integrated into a robust interconnected system of systems, within a revitalized organizational structure, optimized for its operational role.

The Royal Australian Air Force (RAAF) is also espousing a path of transformational change in its C4ISR enterprise. However, the RAAF shift has followed a different dynamic than the USAF. The catalyst of the change initiative in this case is an unprecedented level of equipment renewal. In the recent past and short-term future, the RAAF has and will acquire an

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[19] Department of the Air Force, *Air Force ISR 2023: Delivering Decision Advantage, A Strategic Vision for the AF ISR Enterprise*, (Washington, D.C.: Deputy Chief of Staff for Intelligence, Surveillance, and Reconnaissance, 2013), 4.

[20] Lt Gen David A. Deptula and Maj Greg Brown, "A House Divided: The Indivisibility of Intelligence, Surveillance, and Reconnaissance," *Air and Space Power Journal*, (Summer 2008).

[21] Department of the Air Force, *U.S. Air Force Future Operating Concept: A view of the Air Force in 2035*, (Washington D.C.: Secretary of the Air Force, September 2015), 23.

array of high technology platforms such as the F-35A Lightning II, the EA-18G Growler, the P-8A Poseidon, the E-7A Wedgetail, and the MQ-4C Triton.[22] This provided the perfect culmination of events to *create a sense of urgency* from within the RAAF and initiate a vision for organizational change. This vision was articulated in a transformative document that seeks to inspire the entire organization towards a RAAF optimized for the information age. This document is called Plan Jericho and its *vision* is "to develop a future force that is agile and adaptive, fully immersed in the information age, and truly joint."[23] Although Plan Jericho is not a uniquely C4ISR initiative, most of the program of work is geared towards networking "a modern, fully integrated combat force that can deliver air and space power effects in the information age."[24] One of the most compelling and recurring themes for this transformation is the statement that Plan Jericho will make "the difference between being an Air Force with fifth generation aircraft, and being a fifth generation Air Force."[25] The RAAF is careful to ensure its workforce contributes to change with the second theme of Plan Jericho: "develop an innovative and empowered workforce."[26] This "bottom-up innovation" approach seeks to encourage initiative at all levels of the organization, as suggested by Kotter in his step 5: "Empowering others to act on the vision."[27] The RAAF is shifting from new beginnings into the neutral stage,

[22] Royal Australian Air Force, *Plan Jericho*, website, http://www.airforce.gov.au/plan-jericho/?RAAF-CrI57877JHUU/bo9YoJ64qWYIO7G/14Q.

[23] Royal Australian Air Force, *Plan Jericho Program of Work; Transforming Air Force's Combat Capability*, 25. http://www.airforce.gov.au/docs/Program%20of%20Work.pdf.

[24] Royal Australian Air Force, *Plan Jericho Booklet: Connected and Integrated*, (July 2015), 3, http://www.airforce.gov.au/docs/Program%20of%20Work.pdf.

[25] Royal Australian Air Force, *Plan Jericho*, website, http://www.airforce.gov.au/plan-jericho/?RAAF-CrI57877JHUU/bo9YoJ64qWYIO7G/14Q.

[26] Ibid

[27] Ibid

and following Kotter's step of creating short-term wins, it is deliberately communicating its immediate success within Plan Jericho as reported recently:[28]

> "Operators of the AP-3C Orion aircraft within Air Force's Surveillance and Response Group adapted an existing military surveillance video technology for use outside the classified networks, such as by state and federal emergency services. The Orion is an older aircraft, not one typically looked to for creating new capability. At the recent Air Power Conference, Group Captain Phil Champion demonstrated the results of the improvements by streaming full motion video from one of his aircraft, live, during his presentation"

CAF C4ISR CHALLENGE

In the Canadian context, the struggle with the C4ISR complex problem is more recent. Up to a few years ago, there was no CAF unified C4ISR strategy, leaving individual environments to manage their needs in isolation. This left an empty space creating significant service rivalries and, as Buchanan suggests, room for political maneuvering to secure funds to procure similar capabilities. A lack of C4ISR governance structure to harmonize requirements and doctrine CAF-wide was detrimental to the enterprise, as noted by the VCDS:[29]

> "…platforms and assets are controlled across several levels of command and by many services, components, department, and agencies without joint or integrated doctrine or standards guiding integration and force employment. Sensors for the most part, have been platforms specific, operated by single organizations and not well integrated into operational networks."

With the experience of the Afghanistan conflict highlighting the need for "timely and reliable access to intelligently fused information," the CAF Chief of Defence Staff (CDS) issued a directive in June 2012 to align "C2, CIS, and ISR into an integrated C4ISR architecture."[30] This CDS directive established the Chief of Force Development (CFD) as the CAF lead for Joint

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[28] Vince Chong, "Air Force Encouraged Experimentation Failure and Turned it into Success," *The Mandarin*, (31 March 2016), http://www.themandarin.com.au/62317-jericho-new-technology-uses-experimentation-bottom-innovation/.

[29] Department of National Defence, *Vice Chief of Defence Staff, Joint Intelligence Surveillance and Reconnaissance Operating Concept* (Ottawa: DND Canada, 24 November 2015), 17.

[30] Department of National Defence, Memorandum, *Chief of Defence Staff Directive – Joint C4ISR Requirements* (Ottawa: DND Canada, 11 June 2012), 1.

C4ISR requirements in an effort to help the C4ISR enterprise converge CAF-wide. To achieve this, within the CFD organization, the Directorate of Integrated Command and Control became the Directorate of Joint C4ISR (DC4ISR) requirements, and designated as the "C4ISR Lead Architect for the Department."[31] Arguably, the chain of command for the DC4ISR within the CFD organization, falling under the Director General of Space (DG Space), and later moved under the Director General of Cyberspace (DG Cyber), was not conducive to raising the profile of C4ISR to the level it should have been. The C4ISR organization at a minimum should be at the DG level, alongside DG Space and DG Cyber. This would have better served the C4ISR enterprise when the change effort was introduced, and could have created a stronger sense of urgency of the required change intent. With many Level 1, such as the Environmental Chiefs of Staff (ECS), the Commander of the Joint Operation Command (CJOC), the Commander of Intelligence Command (CFINTCOM), and the Assistant Deputy Minister Information Management (ADM(IM)), as stakeholders in the C4ISR complex problem, the limited authority and legitimacy of a Directorate level organization (DC4ISR) reduced the immediate impact of the CDS directive. This can be related to Kotter's step two of not creating a powerful enough guiding coalition. In an effort to increase the legitimacy of the C4ISR enterprise, a year later in another CDS directive, the Strategic Joint Staff, a Level 1 organization, was tasked to "identify a CAF OPI that will institutionalize ISR operations in the CAF."[32]

Nonetheless, the initial CDS directive was well understood by the newly created DC4ISR and it created a vision that gives direction to the CAF-wide C4ISR enterprise. Under the authority of the Vice-Chief of Defence Staff (VCDS), DC4ISR crafted and recently released two documents that have the potential to shape the CAF C4ISR enterprise. The first document, the

[31] Ibid, 2.

[32] Department of National Defence, Memorandum, *Chief of Defence Staff Directive – CAF Force Posture and Readiness* (Ottawa: DND Canada, 28 June 2013).

VCDS CAF C4ISR Vision Goals and Objectives, provides the CAF with an all-encompassing C4ISR vision statement: "To provide the right knowledge to the right people at the right time in a secure, reliable, and integrated manner in support of Canadian Armed Forces operations."[33] This is the capstone document for the strategic approach that the CAF is directed to take to conceive, design, and build its C4ISR capabilities.[34] The second document, the VCDS Joint Intelligence Surveillance and Reconnaissance (JISR) operating concept, is subordinate to the first document and it seeks to emphasis more specifically the establishment of a "framework for the efficient, flexible, adaptable development of JISR capabilities."[35] This document is more focused in its approach by concentrating specifically on the ISR portion of the C4ISR enterprise, and putting emphasis on collection operations driven by intelligence requirements. There is a danger in isolating JISR within the CAF C4ISR enterprise as it might re-inforce the division of responsibilities and capabilities that is the source of one of the major obstacles of implementing an all-encompassing CAF C4ISR enterprise.

However, the direction provided in those two documents should help bring legitimacy to the C4ISR enterprise by following Kotter's steps of creating and communicating the vision, and create a powerful enough coalition. Unfortunately, Kotter's initial step of establishing a sense of urgency seems to be lacking in both rather lengthy documents.

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[33] Department of National Defence, *Vice Chief of Defence Staff, The CAF C4ISR Strategic Vision, Goals and Objectives V1*, (Ottawa: DND Canada, 10 February 2016), 10.

[34] Ibid, ii.

[35] Department of National Defence, *Vice Chief of Defence Staff, Joint Intelligence Surveillance and Reconnaissance Operating Concept*, (Ottawa: DND Canada, 24 November 2015), i.

RCAF C4ISR

In the last ten years, the RCAF also faced a colossal C4ISR challenge with the introduction of new sensors in various platforms such as the CF-18 SNIPER pod, the CP-140 MX-20 camera and Block 3 modernized mission suite, the CH-146 Griffon MX-15 camera, the Heron UAV in Afghanistan, and the upcoming CH-148 Cyclone and Joint Uninhabited Surveillance and Target Acquisition System (JUSTAS). Many of these new or upgraded systems were introduced in isolation without consideration to how the huge volume of information they gather would be shared across the RCAF and the CAF.

The RCAF is aware of the challenge of integrating its existing platforms into a C4ISR capability of system-of-systems. It has captured this concept within a series of documents both at the strategic and operational level in the last few years, but not within a specific C4ISR framework. The RCAF has articulated its overall strategic guidance framework in the Air Force Vectors (AFV), the capstone RCAF publication that "contains the broad guidance necessary to illuminate and target what the future Air Force will look like."[36] AFV also establishes the RCAF vision of having "An agile and integrated air force with the reach and power essential for CAF operations."[37] AFV's second vector, "integrated," states that the RCAF "will maintain and advance interoperability and pursue full networked capability" which are clearly goals that are necessary for the success of the C4ISR enterprise.[38] However, it fails to specifically link these efforts to the C4ISR concept, not using the acronym even once in the whole "integrated" vector section. Although the AFV espouses jointness and establishes Surveillance and Reconnaissance as one of its core capabilities, it fails to integrate C4ISR as an RCAF operating concept within

[36] Canada. Dept. of National Defence. Royal Canadian Air Force, RCAF Air Force Vectors. Ottawa: Director General Air Force Development. 1 Mar 2013, v.
[37] Ibid, 33.
[38] Ibid, 36.

the CAF C4ISR enterprise. At the doctrine level, the Aerospace Sense Doctrine supports those same principles, but fails to address the C4ISR complex problem as a whole.

In its Future Concept Directive (FCD), the RCAF seeks to foster a force development (FD) framework to help shape the future RCAF. The second core theme in the FCD "Networked Sensors with a Shared Picture" addresses the RCAF C4ISR challenge directly even though it does not use the term C4ISR.[39] Yet, again, it fails to explicitly make the link to higher CAF C4ISR concepts and keeps each domain separate in later sections. This decreases the impact of tackling the C4ISR complex problem, and reduces the opportunity to funnel resources to develop integrated solutions in a future C4ISR enabled RCAF.

Finally, the RCAF Campaign Plan (CP) is the execution document for the Commander RCAF to prioritize efforts at the strategic level. In this document, C4ISR is not addressed directly. The only mention of systems related to C4ISR is in the "support" section where Intelligence and PED support is touched on briefly.

At the operational level, the Commander of 1 Canadian Air Division (1 CAD) recently released the 1 CAD ISR Directive. Although it is ISR specific, this document clarifies the functions and responsibilities of ISR operations in 1 CAD. It is both prescriptive in how ISR will be accomplished, and educative to those who are less familiar with ISR principles. The ISR Directive is a step in the right direction as it demystifies the ISR and PED process, but it is overly focused on existing capabilities and the overland Full Motion Video (FMV) mission at the expense of the greater C4ISR enterprise. It deliberately ignores ISR operations in the maritime surface and sub-surface domain and the processing of other ISR data such as synthetic aperture radar (SAR) imaging, ground moving target indicator (GMTI) data, and signals intelligence

[39] Department of National Defence, *Royal Canadian Air Force, RCAF Future Concepts Directive*, (Ottawa: Director General Air Force Development, 4 Apr 2013), 15.

(SIGINT) data. It does however explain and develop significantly the PED capability that is nascent at the Combined Air Operation Center (CAOC), but it leaves many questions as to how C4ISR will come together lower in the organization at the Wing and Squadron level.

A significant strategic level challenge for the RCAF is the current organizational structure with responsibility for C4ISR being spread out amongst many players without a clear C4ISR champion at a high enough level to provide the convergence necessary to guide the required progress. Because those responsibilities are shared, close coordination between the Director General Air Force Development (DG Air FD), the DG Air Force Generation (DG Air FG), and the Next Generation Fighter Capability (NGFC) Office is required. Even within the DG level organizations the C4ISR portfolio is spread thin across many stakeholders. Within FD, the Director of Aerospace Requirements (DAR) has responsibilities split between DAR3 maritime systems for the CP-140 and CH-148 and DAR8 Uninhabited Aircraft Systems for the JUSTAS program; the Director of Air Domain Development (DADD) has three separate sub-directorate, DADD2 Information Management/ Information Technology, DADD3 ISR, and DADD 4 Surveillance/C3/Information systems. Within FG, the Director Air Readiness and Plans (D Air RP) also has a piece of the C4ISR puzzle with DAirRP2 Intel Policy/PED ISR/Targeting. As each of these sub-directorates are holding part of the strategic RCAF C4ISR enterprise, it is difficult to harness the RCAF energy towards a common goal with the possibility of leaving valuable C4ISR initiatives uncoordinated and unfulfilled. As Buchanan identifies, this is also a possible source of power struggles between the various power brokers which could lead to destructive political behaviour if conflicting agendas are not identified.

ANALYSIS AND RECOMMENDATIONS FOR THE RCAF

Similarly to the RAAF, the RCAF is in a situation where its modernized aircraft and future acquisitions, such as the CF-18, CP-140, CH-146, JUSTAS and Cyclone, will require a significant shift in how C4ISR operations are conducted. Kotter's first step of creating urgency for the change effort was well executed by the RAAF with its Plan Jericho. The RCAF should leverage this opportunity in a similar manner by raising awareness about the magnitude of the change necessary to keep its forces relevant in the rapidly changing information age. It needs to emphasize how the entire C4ISR effort is connected throughout the RCAF and the CAF, and how this is a decisive moment because of the crucial impact that an integrated and connected C4ISR system will have in defining future operations.

Through various documents and initiatives, the RCAF has stated its intent to pursue the goal of supporting joint operations and becoming more integrated with other components of the CAF and its allies. However, it has not crafted a specific overarching RCAF C4ISR Strategy that could guide the efforts of the various stakeholders within the organization, or conveyed a strong sense of urgency. This is a significant obstacle in moving the RCAF C4ISR enterprise in line with the direction given in the CDS directive and the recent VCDS CAF C4ISR Strategic Vision, Goals and Objectives. Following the USAF example of using Kotter's step three and four of "creating and communicating the vision" the Commander should publish a *RCAF C4ISR Strategic Vision* document outside of the already existing doctrine and capstone publications. This vision document should be concise, establish clear goals and objectives, assign responsibilities and accountabilities to its stakeholders, and create urgency for the change effort. The Strategic Vision must be tirelessly communicated through all means at the disposal of the RCAF, such as the Air Force Journal, Crew Brief, and the RCAF web-based communications.

This message should be sustained so that there is no doubt that the RCAF leadership is committed to the C4ISR enterprise.

Because the RCAF is so deeply involved in C4ISR, it must be at the forefront of the CAF C4ISR enterprise. To avoid the trap of political behaviour and to be one of the major power brokers from the onset, it should play an active role in developing solid relationships amongst the leading C4ISR stakeholders across the CAF. This implies that, at the strategic level, the Air Staff needs an organizational restructure to create a single C4ISR champion, at the Director level at a minimum, so that it can have a unified voice outside of the RCAF at an influential rank level. Within this restructure, the Air Staff should be regrouped in more functional areas that could remove the boundaries of the requirements and the air domain development. Both these initiatives will ensure that the RCAF has a powerful guiding coalition to lead the C4ISR change effort and that opportunity for power struggles and political maneuvering will be minimized.

At the operational level, the 1 CAD ISR directive should be renamed the *1 CAD C4ISR directive* in its next iteration. This will ensure that the 1 CAD message is in line with the VCDS C4ISR Vision and the proposed RCAF C4ISR Strategic Vision, thus creating a coherent set of documents that will convey a clear message as to the importance of the change effort. Following the example of the USAF with its 25th Air Force, and to create a strong guiding coalition at the operational level, the RCAF should regroup its C4ISR people, assets and capabilities in a single organization and to the maximum extend, a single location. The RCAF should create a C4ISR Wing at 14 Wing Greenwood, already home to the only dedicated C4ISR platform in the RCAF, the CP-140 Aurora. This C4ISR center of excellence should also be home to the upcoming JUSTAS capability and be the main PED node for the RCAF. The PED should be based on the U.S. DCGS, and be the main entry point to process data provided by manned and unmanned

platforms throughout the RCAF and the CAF, and also be connected with our U.S. allies. Co-locating flying and non-flying aircrews with intelligence specialists would create a synergy within the C4ISR enterprise and help develop shared goals thus creating a true sense that C4ISR are operations. Within this construct, a C4ISR presence should be kept on the West coast at 19 Wing Comox, but it should be functionally controlled by the C4ISR center located at 14 Wing. In particular, members of the C4ISR Wing should be empowered to develop new ways to optimize C4ISR operations, and these successes should be celebrated loudly across the C4ISR enterprise, and the CAF writ large, to sustain the change effort, and allow the transition from the neutral phase into new beginnings.

CONCLUSION

With the recent clear directive given by the VCDS, the RCAF must react to adapt its C4ISR enterprise to that of the CAF Vision. By looking at recent change initiatives in the USAF and the RAAF, the RCAF is in a good position to draw the best lessons of both allies.

In its adaptation to the information age, the RAAF was especially good at leveraging its unprecedented acquisition of high technology platforms to create a sense of urgency with its Plan Jericho. It made sure that there was room for “bottom up innovation” therefore empowering its members to be creative in moving C4ISR forward. The RAAF is communicating its change vision tirelessly and is adept at sharing its short-term wins to build the momentum necessary to shift the organization to the new beginnings phase.

The USAF was equally skillful at creating and communicating a powerful vision for its C4ISR organizational change effort. It empowered its workforce to develop and implement the DCGS which is now their key PED asset. Perhaps the best lesson that can be drawn by analyzing

the USAF C4ISR plan is how it used a structural re-organization to cement its change effort. By re-grouping all its C4ISR assets under the 25th Air Force and putting it under the Air Combat Command, the USAF has built a nearly unstoppable guiding coalition that feeds from its own successes. The focus of the USAF C4ISR enterprise is undeniable, and the level of authority conferred to the Commander of the 25th Air Force ensures that the C4ISR voice is heard at the highest levels of the organization.

The RCAF can follow the best practices of these two organizations in shaping its C4ISR enterprise and incorporating organizational change principles in its effort. It must embrace this opportunity to adapt to the information age by crafting a RCAF C4ISR Strategic Vision that is both compelling in creating a sense of urgency, and concise enough that it can be embraced by every member of the organization. By creating a better structural strategic organization that incorporates a C4ISR champion at a high rank level, the RCAF will ensure that its voice is loud at the CAF C4ISR table. By doing so, it will also minimize opportunity for power struggles from within, and be ready to engage external stakeholders from the onset to reduce possible political behaviours at the CAF level. Finally, it should follow the USAF lead by regrouping all its C4ISR people, assets and capabilities into a single organization at the operational level. This will create a synergy that will drive the C4ISR organization to new heights faster and more efficiently and make everyone understand that C4ISR are operations.

By doing so, the RCAF will become a better integrated component of the CAF, ready to lead the C4ISR change effort and ensure that it remains relevant within this technological paradigm shift that is the information age.

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