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CONNECTING THE DOTS: PREPARING THE RCAF FOR A LINK-ENABLED FUTURE

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A LINK-ENABLED FUTURE**

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CONNECTING THE DOTS: PREPARING THE RCAF FOR A LINK ENABLED FUTURE

A Service Paper for Commander of 1 Canadian Air Division

AIM

1. Although the necessity of advanced tactical data links (TDL)¹ within the Royal Canadian Air Force (RCAF) is widely acknowledged, personnel resources being committed to establish, operate and sustain these technologies are insufficient. The aim of this service paper is to demonstrate the need for the RCAF to grow TDL capacities within its Wings to support the generation of link-enabled capabilities for domestic and expeditionary operations. It will also offer recommendations to move toward addressing this challenge within the next five years. Despite a concurrent need for similar attention at the strategic and operational levels of the RCAF, the primary focus of this analysis and resulting recommendations will be at the tactical level and more specifically centered on ground-based capacities.

INTRODUCTION

2. Advances in data link technology continue to significantly improve the application of air power and have demonstrated unquestionable benefits in the joint environment across the full spectrum of conflict. The increased connectivity and data sharing between battlefield nodes in the air, surface and sub-surface has led to the prevailing concept of a *system-of-systems* or *network centric approach* to air power, as opposed to the *platform centric* approach of the past. “The RCAF must be capable of contributing to and exploiting a system-of-systems approach that now defines most modern militaries.”² This high degree of connectivity and data exchange is critical to Command and Control (C2) and situational awareness for a *Fifth Generation Air Force* operating in a combined joint environment.³ The RCAF acknowledged this paradigm of networking and data fusion capabilities as an *Enabling Concept* key to the future of air power in Canada.⁴ Thus, attention on this matter has become a recurring theme in RCAF and Canadian Armed Forces (CAF) strategic documents and force development plans.

3. Although 1 Canadian Air Division (1 CAD) has long been employing a variety of data links in the execution of its North American Aerospace Defence (NORAD) mission,

¹ Department of National Defence, “DAOD 6002-5 Tactical Data Links” Last accessed 10 October 2018. <http://www.forces.gc.ca/en/about-policies-standards-defence-admin-orders-directives-6000/6002-5.page>. TDLs are defined as “A communication link that uses a standard message format for the exchange of bit-oriented digital information. Note – A tactical data link interfaces two or more command and control or weapons systems via multiple communication media.” This is the definition that this paper will utilize which includes exchange of data, voice, video and other imagery forms.

² Department of National Defence, *Strong, Secure, Engaged. Canada’s Defence Policy*, Ottawa: DND Canada, 2017, 39.

³ Peter Layton. *Fifth Generation Air Warfare*, Royal Australian Air Force Air Power Development Centre: June 2017, 10-11.

⁴ Canada. Department of National Defence, *Projecting Power: Canada’s Air Force 2035*, Trenton, ON: Canadian Forces Air Warfare Centre, 2009, 53-55.

the requirements have grown in other domestic and expeditionary mission sets. This increased scope has created an imbalance between the high demand and short supply of qualified personnel with expertise in TDL.

DISCUSSION

4. The discussion will first highlight the importance of data links within CAF and RCAF strategic visions and doctrine. It will then analyse emerging capabilities and current tactical level capacities to demonstrate the requirement to grow and organize resources at the Wing level in order to sustain data link operations at home and abroad.

Strategic Views

5. Although guidance from the strategic level specific to TDLs is scarce, it is frequently referred to directly or implied throughout numerous CAF and RCAF doctrines and strategic visions of the future. It is important to draw the relevance of TDLs from some of these references to show the impetus for the RCAF to further invest in developing its capability.

6. TDLs are implied throughout RCAF capstone doctrine. Applications such as Link-16 or Tactical Common Data Link (TCDL)⁵ enable coordinated activity across the RCAF functions of *Command, Sense, Act* and *Shield*.⁶ In an ideal situation, fusion of information shared across TDLs provides commanders at all levels with near real-time situational awareness upon which to make decisions. They can in turn use the TDLs to assign and monitor ongoing tasks. In providing the means to link air platforms with each other and with nodes on the surface, TDLs are leveraged to facilitate improvement of numerous operating procedures and tactics within each of the RCAF's *Core Capabilities*.⁷

7. The *CAF C4ISR Strategic Vision, Goals and Objectives* clearly establish the significance of TDL in the enablement of an effective C4ISR⁸ system. One objective defines the J-series message format⁹ as the *Common Tactical Data Link for Joint and Multinational Operations*. With plans to expand Link-16 on its platforms, the RCAF is well positioned to meet this objective. The document surmises that implementation of Link-16 in compliance with NATO standards “will allow coalition combat elements to safely work together without fear of friendly fire and to precisely target enemy forces with maximum effect and minimal collateral damage.”¹⁰ In consideration of the

⁵ TC DL is a waveform commonly used for the transmission of real time full motion video or synthetic aperture radar imagery.

⁶ Department of National Defence, B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine*, Ottawa: DND Canada, 2016, ch. 4.

⁷ *Ibid*, 32

⁸ Command, Control, Communications, Computers, Intelligence Surveillance, and Reconnaissance is abbreviated to C4ISR.

⁹ The J-series message format is used in both Link-16 and Link-22 TDLs. It is bounded by NATO standards and is commonly employed across most western militaries.

¹⁰ Department of National Defence, *The CAF C4ISR Strategic Vision, Goals and Objectives*, Ottawa: DND Canada, 10 February 2016, 32, 5.7.

expanded definition of TDLs for this paper, they are heavily relied upon to enable many of the other CAF C4SR strategic Objectives. In particular, the objective of *Every Platform a Sensor*¹¹ has become a buzz term that has been further reinforced in Strong Secure and Engaged (SSE) with regards to the RCAF. SSE elaborates that “every Royal Canadian Air Force platform, be it piloted, remotely piloted or space-based, also acts as a sensor ensuring that information and intelligence gets to decision-makers in a timely fashion.”¹² SSE also demands the RCAF “...be capable of contributing to and exploiting a system-of-systems approach that now defines most modern militaries”. As such, most aircraft planned for in the list of SSE initiatives will have some form of TDL on board.

8. As recognized throughout these strategic documents, TDLs are essential in the delivery of modern air power today. With our major coalition and joint partners are relying on TDLs as an essential interoperability tool, they expect that the RCAF to be conversant within this capability area. “There is no longer any option but to transform into an integrated and networked force.”¹³ The RCAF, and in particular 1 CAD, must adapt to a future where TDLs have an even greater degree of prominence within domestic and expeditionary aerospace operations.

Growing Presence of TDLs in the RCAF

9. With ongoing upgrades to existing aircraft as well as new platforms and ground based communications nodes on the horizon, RCAF projects continue to expand the TDL footprint. Some of these projects include:

- a. C130J. An upgrade to the C130J fleet in 2016 delivered Link-16 capability.¹⁴ Integration of the capability has recently been accelerated in support of Operation IMPACT in Iraq.
- b. CP140 Block Program and Multi-Mission Platform. In addition to possessing TCDL for passage of sensor data to the Deployable Mission Support Centre (DMSC), the Aurora Incremental Modernization Project Block IV upgrade will add Link-16 capability to the aircraft and within the DMSCs on the ground at 14 and 19 Wings.¹⁵ It is highly probable that the CP140’s replacement, due in 2030, will have the similar TDL capability on board.

¹¹ Ibid, 37-38, 5.14.

¹² *Strong, Secure, Engaged*, 38.

¹³ Department of National Defence, A-GA-007-000/AF-008, *Air Force Vectors*, Ottawa: DND Canada, 2014, 6.

¹⁴ Canada. Government of Canada, “Upgraded CC-130J Hercules aircraft”, Ottawa – National Defence, 18 October, 2016. <https://www.canada.ca/en/department-national-defence/news/2016/10/upgraded-130j-hercules-aircraft.html>.

¹⁵ Department of National Defence, Aurora Incremental Modernization Project (AIMP) Website, Assistant Deputy Minister (Material). Last accessed on the Defence Wide Area Network on 10 October, 2018. <http://material.mil.ca/en/air-programs-projects/aurora-incremental-modernization-project.page>.

- c. Tactical Aviation. Although not yet formalized, 1 Wing is considering submission of a Statement of Operational Capability Deficiency related to the lack of Link-16 onboard.¹⁶
- d. Next Generation Fighter. SSE states that Canada's next fighter to interoperate within NORAD and NATO allies and capable of seamlessly integrating into the joint environment.¹⁷ If Canada selects the F-35, it will be equipped with its own proprietary TDL required to maintain stealth.
- e. Remotely Piloted Aircraft Systems (RPAS) Project. This project, rejuvenated by SSE, will deliver a medium altitude unmanned aircraft that will be employable in a multitude of domestic and expeditionary roles. Utilizing TDLs, it will "operate as part of a system-of-systems network and will be capable of providing near real time information to tactical, operational and strategic commanders..."¹⁸
- f. Tactical Integrated Command, Control, Communications – Air (TIC3-Air) Project. Another project revitalized by SSE, it will deliver numerous fixed Link-16 and TCDL ground entry stations across Canada. It will also augment and formalize current expeditionary TDL capabilities that were grown ad-hoc in response to operational requirements. Lastly, it will provide an air-borne TDL relay, likely onboard the CC-150 Tanker platforms.¹⁹

10. The number of initiatives ongoing across suggest that the RCAF will answer the call of possessing modern link capabilities needed to operate in a domestic or international settings alongside its mission partners. However, just as important as the technologies being procured, are the people who work to integrate and operate them. As new capabilities are delivered, there is a continuing propensity to overlook the need for trained personnel to tackle the complexity of TDLs as a whole. Many of the projects listed above are either Person Year (PY) neutral or will focus additional personnel resources solely on the needs of platform and not consider the system. If not addressed, this problem will degrade the RCAF's ability to realize the full potential that new link enabled platforms and technologies bring to the fight and will negatively impact its ability to integrate into the *system-of-systems*. 1 CAD must carefully assess each new platform or capability with regards to its impact on the extant TDL capacity and identify additional PYs if required.

¹⁶ Ken Mahon, Senior Staff Officer Data Links, 1 Canadian Air Division. Email exchange 10 October, 2018.

¹⁷ *Strong, Secure, Engaged*, 38.

¹⁸ Department of National Defence. "Update and new name for the Joint Unmanned Surveillance Target Acquisition System (JUSTAS) project", 14 November 2017, <http://www.rcfarc.forces.gc.ca/en/news-template-standard.page?doc=update-%20and-new-name-for-the-joint-unmanned-surveillance-target-acquisition-system-%20justas-project/j9u7rzyf>.

¹⁹ Department of National Defence, Tactical, Integrated, Command, Control, Communications Project Website, Assistant Deputy Minister (Material). Last accessed on the Defence Wide Area Network on 10 October, 2018. <http://material.mil.ca/en/air-programs-projects/tactical-integrated-command-control-communications-project.page>.

Building Personnel Capacity

11. As many of RCAF aircraft were not previously equipped with advanced TDL capabilities, there has not been a need to establish a section focused on coordination of data link operations at each of the flying Wings. In areas where TDL support is a routine part of day-to-day operations such as the Canadian NORAD Region, the DMSCs and the Tactical Radar Squadrons (TCRs), the capabilities are tied to specific missions or platforms. Both the TCRs and DMSCs also have deployable mandates. Recognizing the need for fixed TDL support staff at the Wings, the 1 CAD Data Links Concept of Employment called for *Wing TDL Coordinators (WTCs)* at each Wing. This position would be responsible for everything from being an interface for network planning and coordination to being responsible for local procedures and equipment management.²⁰ However, no PYs were allocated and lack of formalized training for this role has led to delays in implementation. 1 CAD must investigate options to source positions internally or through the Multi-Year Establishment Plan (MYEP)²¹ to avoiding double-hatting, if possible. Moreover, as identified at the 2018 RCAF Data Links Advisory Panel, the development of a WTC course and assignment of an Operational Training Unit (OTU) is required within the next two years in order to be ready to train future incumbents.²²

12. Once established, the WTC should work within the Operational Support Squadron and be at a minimum rank of Sergeant. This will ensure the incumbent is capable of effectively coordinating with air crews as well as providing advice to senior Wing leadership. The occupation of the WTC should be selected in consideration of the types of TDLs being employed, but generally would be an Aerospace Control Operator.

13. The wide scope of responsibilities planned for WTCs at their Wing may exceed the capacity of one individual. Each WTC will require a dedicated section or trained supporting cast from Air Traffic Control, Wing Telecommunications Flight or other units. As the nature and intensity of TDLs at each Wing will differ, a needs analysis should be conducted at each Wing to specify the required number of staff and skillsets required to adequately support local TDL operations. The analysis should not only focus on the current gaps, but project the personnel requirements over the next 10 to 15 years as new platforms and TDL capabilities come on-line to accurately reflect.

14. One area that to be explored for potential technical expertise is within the Wing Telecommunications Flights. The installation of new surveillance radars at RCAF managed aerodromes has led to a significant reduction of annual maintenance from 780

²⁰ Department of National Defence, “1 Canadian Air Division – Data Links Concept of Employment”, Winnipeg: RCAF, 29 March 2016, 15, 3.6. Terminology in this document referred to the position as a Link Unit Manager. The proposed title for the position has evolved in more recent documentation to Wing TDL Coordinator.

²¹ Annual process to apportion military positions across level one organizations chaired by the Vice Chief of Defence Staff.

²² Department of National Defence. “RCAF Data Links Advisory Panel 2018 – Record of Discussion”, 5-7 September 2018, Annex C, 3.

to 24 hours.²³ Responsible for servicing these radars are the Aerospace Telecommunications and Information Systems technicians who coincidentally have begun instituting TDLs into their core training.²⁴

15. Like the WTCs, technical training on TDL equipment needs to be developed. The current series of NATO standard courses offered at 51 Aerospace Control and Warning Operations Training Squadron are predominately focused on data link theory and network design. Formalized technical training on equipment such as system integrators, radios, ground-based antennae, and networking tools for distribution of information is extremely scarce.²⁵ Training for these capabilities is often conducted in an ad-hoc manner at the unit level. As all of these capabilities are fielded to a limited extent within the RCAF presently, there is a more urgent need for this training than the WTC course. Once developed, such training could be facilitated by the Aerospace Telecommunications and Engineering Support Squadron (ATESS) which has traditionally been responsible for such highly technical training.

Sustaining Expeditionary Operations

16. The coming expansion of the TDL footprint will prompt the need to address short falls in the Force Generation (FG) of expeditionary TDL capability. The deployment of 8 Air Communications and Control Squadron's (8 ACCS) Tactical Interface Control Cell (TICC)²⁶ on Operation IMPACT demonstrated immense benefit to coalition interoperability and common situational awareness from the Combined Aerospace Operations Centre to collation aircraft operating in Kuwait. At present, only 8 ACCS has a mandate for the TICC which is normally limited to 60 days deployed. As a gap fill to sustain the TICC function at Operation IMPACT, 1 CAD was forced to coordinate ad-hoc training, pulling from whichever Wing had the capacity.²⁷ To rectify, 8 ACCS is in the final stages of developing the *Expeditionary Data Link Specialist EDLS Course (EDLSC)* which builds on core TDL training to prepare operators and technicians for expeditionary operations. Another issue is that 8 ACCS is only staffed for a single line of task. For an in-demand capability, this poses significant challenges in scheduling of FG training as each exercise commitment takes the capability off of high readiness.²⁸ The draft Master Implementation Plan for to reshape 8 ACCS calls for second line of task that remains without PY offset. Approval of that portion would require sourcing of 6 positions from across all 1 CAD units but would provide more flexibility to support concurrent short duration missions or conduct FG without impacting readiness.²⁸

²³ Steven Norwich. Airfield Radar Life Cycle Material Manager. Email exchange, 11 October 2018. Data provided in the email was extracted from Canadian Forces Technical Orders for former and new radars.

²⁴ "RCAF Data Links Advisory Panel 2018...", Annex C, 2.

²⁵ Department of National Defence, "1 Canadian Air Division – Tactical Data Link Front End Analysis Report", May 2017, Annex E, Row 39.

²⁶ The Interface Control Cell is a common term used to describe a unit responsible for multi-link coordination for a given area of responsibility.

²⁷ Author was responsible to arrange training as the A6 Operations Officer at 1 CAD, 2014.

²⁸ Personal experience of the author as Commanding Officer of 8 ACCS, 2016-2018.

17. In the short term, to fill the gap in ability to sustain expeditionary operations beyond initial deployment by 8 ACCS, there are a few options. Although the TCRs and DMSCs have similar capabilities to 8 ACCS, there are some equipment deficiencies, they do not share the same standard operating procedures and are not available to be tasked without risk to their core mandate. Likewise CADS has a number of personnel with TDL experience, albeit in a mostly static network environment. However, providing individuals within these units with the EDLSC will bridge the gap. Establish teams early and providing the units with a predictable schedule would allow them to mitigate the risks to their own mandates.

18. In the long term, the capacity within the Wings, as discussed in the previous section, could be drawn upon to build into the Managed Readiness Plan to sustain expeditionary operations, again provided with the requisite training for the expeditionary environment.

CONCLUSION

19. Historically, the RCAF has taken a *platform centric* approach to Force Development whereby replacement platforms are delivered with little to no consideration for additional personnel required to maximize new operational capabilities. If 1 CAD truly wants to integrate into a system-of-systems, it must strive to attain personnel resources and organize them appropriately to enable that platforms integration into the system. These subject matter experts will be critical in achieving the RCAF vision of being *agile* and *integrated*.²⁹

RECOMMENDATIONS

20. The following is a summary of proposed recommendations:
- a. Investigate options internally or through the MYEP to source WTCs across Wings with TDL enabled platforms;
 - b. Drive creation and assign WTC course to an OTU;
 - c. Convene a needs analysis to determine size and scope of TDL Operations at each Wing and determine if potential to shift workload onto Wing Telecom Flights based on reduced radar maintenance;
 - d. Assign development and implementation of technical training to ATESS;
 - e. Approve growth of 8 ACCS TDL positions;
 - f. Conduct risk assessment of leveraging resources at CADS, TCRs and DMSCs to support short term FG needs; and

²⁹ *Air Force Vectors*, 33.

g. Once established, integration of Wing TDL personnel into the Managed Readiness Plan.

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