National Defence Défense nationale

Canadian Forces College

Collège des Forces Canadiennes

RCAF LEADERSHIP AND THE CULT OF THE PILOT: REASSESSING A WWII ORGANIZATIONAL STRUCTURE

By Major M. Snook

JCSP 44

Master of Defence Studies

Disclaimer

Opinions expressed remain those of the author and do not represent Department of National Defence or Canadian Forces policy. This paper may not be used without written permission.

PCEMI 44

Maîtrise en études de la défense

Avertissement

Les opinons exprimées n'engagent que leurs auteurs et ne reflètent aucunement des politiques du Ministère de la Défense nationale ou des Forces canadiennes. Ce papier ne peut être reproduit sans autorisation écrite.

Canada

CANADIAN FORCES COLLEGE/COLLÈGE DES FORCES CANADIENNES
JCSP 44/PCEMI 44

28 August 2018/28 août 2018

PR500 Defence Research Project

RCAF LEADERSHIP AND THE CULT OF THE PILOT: REASSESSING A WWII ORGANIZATIONAL STRUCTURE

By Major Melissa Snook

Word Count: 19,745

Nombre de mots: 19,745

TABLE OF CONTENTS

ABSTRACT

This paper examines the RCAF's long-standing rationale for pilots dominating the RCAF's leadership and ops positions. Through an analysis of the roles of pilots in WWI and WWI, history proves that this model was the result of a resource-constrained interwar period in Britain. When the RAF downsized post WWI, pilots were forced to become "general duties" officers, gaining new responsibilities outside of regular flying duties. With heavy British influence, Canada set up its air force in 1924 much the same way. When WWII broke out, this organizational structure of having pilots carry out most key leadership and ops responsibilities remained, mainly due to the fact that it became solidified after more than twenty years of practice between the wars.

The concept of leading from the front that was first introduced by the Army and was later adopted by the RAF, as key leaders in the WWII lead formations of aircraft into battle, demonstrating their ability to share risk with line pilots. Due to significant casualties on the battlefield and a lack of situational awareness, the army's application of this concept evolved and commanders moved to the rear where they could better influence the operation (cavalry provides a good example). However, the RAF continued to have pilot commanders lead the charge in the air, resulting in significant casualties and a leadership crisis for the RAF.

The lack of evolution of this concept for the RCAF has unfortunately continued to reinforce the ideology more than 100 years later, that being a pilot is one of the only ways to 'lead from the front,' understand the operation, and share risk with subordinates. As a result, most key leadership and ops positions remain restricted to pilots. Compounding this, pilots receive minimal leadership training in their current occupation/career path and unlike their peers, have limited experience leading subordinates until promoted to the rank of Major.

An analysis into future operations reveals that there is a gap between the capabilities of the RCAFs current model and the flexibility, agility, and internal integration that will be required for success going forward. Ops centre positions do not normally include non-pilot occupations, which limits other critical inputs (i.e. logistics, maintenance, engineering, signals) from being considered when operational decisions are being made.

Air Canada provides a modern-day example of an organization that manages significant risk, as the company moves hundreds of thousands of passengers around the world each day. Although the scope of the organization is different than the RCAF, an internship with the company highlighted some key lessons that air force ops centres could benefit from. These lessons are centered on selecting the best person for the job, setting and measuring clear goals, and minimizing the risk of bias in decision-making.

To meet the complexities of war by providing responsive, relevant, and effective airpower, it will be essential for the RCAF to operate at its maximum operational potential. To do this it must optimize its current construct by opening its key leadership positions to all air force occupations, and diversifying its op centres.

CHAPTER 1: INTRODUCTION

The Canadian Air Force has a long-storied history dating back nearly 100 years and has seen action in several major world conflicts. Throughout this history, the air force has worked extremely hard developing new weapons systems and capabilities to continually meet its governmental mandate. The mission of the Royal Canadian Air Force (RCAF) is currently to "provide the Canadian Forces with relevant, responsive and effective airpower to meet the defence challenges of today and into the future."[1] This task is one that continues to require perseverance, innovation, and agility.

The RCAF has built an incredible reputation that actually began before it was officially formed, through its personnel contributions in the British air services, the Royal Flying Corps (RFC), and the Royal Naval Air Service (RNAS). In 1918, for example, there were close to 20,000 Canadians serving in the RFC, supporting the WWI effort.[2] Canada has since built upon these humble beginnings, and with heavy Royal Air Force (RAF) influence, developed its own air force that has been recognized for its contributions worldwide. Some of these contributions include WWII, search and rescue along Canadian coastlines, peace support in Kosovo, disaster relief in devastated countries such as Haiti and the Philippines, and, more recently, combat missions in Libya and Afghanistan, to name a few.[3] While there is no doubt that the RCAF has provided effective airpower to meet the needs of the country, and still does today, the question that

---

[1] Department of National Defence, "Royal Canadian Air Force Overview," last modified July 5, 2018, http://www.rcaf-arc.forces.gc.ca/en/overview.page.

[2] Allan D. English, "The Masks of Command: Leadership Differences in the Canadian Army, Navy and Air Force" in *The Operational Art: Canadian Perspectives, Leadership and Command.* (Kingston: Canadian Defence Academy Press, 2006), 8.

[3] Department of National Defence, "Current Operations List," last modified May 29, 2018, http://www.forces.gc.ca/en/operations/current-list.page

needs to be answered is whether or not its airpower output is reaching its maximum operational effectiveness.

For airpower outputs to be as effective as possible, the organization itself has to be optimized, or as functional as possible.[4] However, the challenge of optimization for the RCAF naturally arises when comparing the wide spectrum of tasks that the RCAF is expected to accomplish with its limiting organizational structure. The future will require the RCAF to support and prepare for complex operations against unknown and undefined adversaries in multilayered battle spaces. And to meet these demands, the government has called for a "fundamentally new, agile, modern and responsible approach to defence."[5] However, an agile and responsible approach entails having the strongest leaders and robust operations teams to effectively respond to these complex scenarios.

The RCAF currently restricts most of its key leadership and operations positions to pilots, which constitutes a small pool of candidates, rather than selecting individuals from across all disciplines within the RCAF. Furthermore, the majority of the positions in RCAF operations (ops) centres are also pilots, which limits opportunities for other points of view being considered. This is the case for positions at the tactical, operational, and strategic levels (with some navigators by exception).[6] This is significant, as it may be preventing the RCAF from reaching its maximum operational effectiveness.

Having pilots dominate these positions may seem logical, since the Air Force exists to provide airpower to the CAF. However, this organizational construct was modeled off

---

[4] Merriam-Webster, "Optimize" definition, last accessed May 15, 2018, https://www.merriam-webster.com/dictionary/optimize.

[5] Department of National Defence, "Strong, Secure, Engaged," *Canada's Defence Policy* (2017): 63.

[6] Note that Aircraft Combat Systems Officer (ACSO) is the new terminology for the navigator occupation. However, this paper will use the term "navigator" for ease of referring to the occupation in previous as well as current context.

Britain's RAF (formerly RFC) structure when it was in its resource-constrained state post-WWI, and has never been validated for operational effectiveness. With the RCAF at an important crossroads in its evolution, it is time to review this construct.

Leadership in the Canadian Forces: Conceptual Foundations indicates that the performance and effectiveness of an organization is determined by the skills and abilities that an individual contributes to a work group, as well as its group characteristics (including its structure and communication patters).[7] These individual and group characteristics can function together as force multipliers or, if they are not optimal, they are encumbrances on individual and group performances.[8]

In the case of the RCAF, restricting key positions to pilots prevents individuals from other occupations, with potentially better skills and abilities, from contributing in roles that could enhance the Air Force's performance. Pilots, for example, receive minimal leadership training in their current occupation/career path and have limited opportunities to lead subordinates until promoted to the rank of Major. Similarly, a group such as an ops centre that also consists of mainly one occupation, can promote harmful group tendencies such as confirmation bias while simultaneously stifling helpful tendencies such as diversity of thought. When decisions are made that have not necessarily considered the problem from all angles or do not represent the organization as a whole, the result could introduce risk to the operation or the organization. Therefore, it is not only important to ensure the right individuals occupy key positions, but also that

[7] Department of National Defence, *Leadership in the Canadian Forces, Conceptual Foundations* (Kingston: Canadian Defence Academy – Canadian Forces Leadership Institude, 2005): 2.
[8] DND, Con*ceptual Foundations*, 2.

ops centres have the right structure and communication patterns to function as best as possible.

Ops centres must also ensure that clear airpower objectives are identified in order to track and make changes where required. Otherwise, in a fast-paced world the RCAF could quickly become irrelevant. This means that measures of performance and success also have to be clear and achievable. Based on the RCAF structure being pilot dominated for the last 95 years, some of its performance indicators may be biased and need to be re-considered from other perspectives. If ops centres become more diverse, it would be an easy transition to ensure that all aspects of the organization, such as logistics and engineering, are appropriately taken into account.

This essay will therefore examine the RCAF's current organizational/leadership construct and its operational effectiveness, and compare this with the future airpower requirements mandated by the Canadian government. It will be shown that for the RCAF to provide relevant, responsive, and effective airpower in future operations, it will have to optimize its current construct by opening its key leadership positions to all air force occupations, and diversifying its op centres.

To support this thesis, table 4-1 "Responsibilities of CF leaders" in *Leadership in the Canadian Forces: Conceptual Foundations* will be used to define effective leadership in organizations at the tactical and operational levels.[9] Using the dimensions of "leading the people" in *Conceptual Foundations*: structuring and integrating teams for optimum efficiency and coordination, external adaptability, accomplishing the mission, and

[9] DND, Con*ceptual Foundations*, 49.

ensuring member well-being, will demonstrate the gaps in leadership and effectiveness within the RCAF.

This essay will be broken down into seven chapters, with each chapter highlighting gaps that will likely prevent the RCAF from reaching its maximum potential in future operations. Following this introduction, the *Historical Context* chapter will first deep-dive into the influence that the RAF had on the RCAF post WWI and outline how "the cult of the pilot" was formed. *Leading from the Front* will build from the history chapter, as it will highlight the origins of commanders leading soldiers into battle – pilots leading the air force – and will reassess its validity in a modern context. The *Current and Future Operations* chapter will identify current ops as well as the complex security environment that Canada will be expected to face. The future operations section of this paper will also cover the importance of internal integration and external adaptability from the effectiveness dimensions. This will lead into the *Effective Airpower* chapter that will discuss mission success, and highlight some of the key performance indicators and measurements that the RCAF should focus on in order to optimize its outputs.

The *Leadership and Technical Ability* chapter will examine the positive and negative outcomes associated with pilots in management roles in the CAF, and will draw some comparisons with other industries and allied countries. This chapter will provide background on the skills and abilities currently included in pilot training and relate this to the effectiveness dimension of "member well-being." Finally, the *Conclusion* will tie these main ideas together to reaffirm the requirement for the RCAF to open its key leadership positions to all air force occupations, and diversify its op centres in order to provide relevant, responsive, and effective airpower to the CAF in future operations.

Literature Review and Academic Research

The literature review for this paper started with gaining an appreciation for the abilities of non-operators to be effective in command positions. An excellent paper written in 1997 by then Major (later Lieutenant-General) David Millar when he was a student at the Canadian Forces College provides this overview with respect to senior command positions. Millar, an Aerospace Engineer, argued in his thesis was that "all officers, regardless of occupation, can be senior commanders in the Canadian Forces" and demonstrated that "the non-operators are [just] as suitable for senior command in modern warfare as the operators."[10] Millar's essay provides a walk-through of the professional development and formal training that is provided to officers as they move through the ranks, and proves that the requisite training and experience is given to all officers, not only those who have commanded a Squadron.

While Millar's argument focuses on the abilities of non-operators to perform in senior command positions, his analysis does not tackle the issue at the tactical and operational levels. Therefore, this essay aims to fill this void by taking the argument a step further to demonstrate that no command (or other leadership and ops) positions should be limited to one occupation, by highlighting the challenging requirements of future operations to substantiate the theory. Due to the thorough paper written by Millar that covers senior command (strategic), this study will mainly focus on positions at the tactical and operational levels.

Although the RCAF currently limits most of its key leadership positions to pilots (with exceptions for Navigators and in some cases Aerospace Controllers), research has

[10] D. B Millar, "Why Can't I be CDS," *Canadian Forces Joint Command and Staff Program Paper, Canadian Forces College* (1997): 2.

proven that this was not always the case. In *Canadian Airmen and the First World War: The Official History of the RCAF,* S.F. Wise reveals that individuals were selected for leadership positions in the RAF based on merit, rather than solely occupation.[11] For example, Wise indicates that one of the RFC's largest flying training organizations was commanded by a Canadian cavalry officer, Alfred Critchley. At 28 years old, based on his strong reputation as a leader, he was promoted to Brigadier-General and seconded by the Royal Flying Corps (RFC) to command.[12] Contrarily, the restriction of most leadership and ops positions to pilots has been generally accepted. There is no evidence to indicate that this organizational construct has ever been seriously challenged since its 'implementation' post WWI. Additionally, a study of this evolution and its validity has not yet been conducted nor has it been assessed against the operations of today or the future.

Allan English, a former RCAF Navigator and associate professor at Queen's University, is the author of a book chapter titled "The Masks of Command: Leadership Differences in the Canadian Army, Navy and Air Force" within *The Operational Art: Canadian Perspectives.*[13] In his study of air force leadership, English provides a review of Sir Hugh Trenchard's role in solidifying pilot dominance of the RCAF, or in English's words, the "cult of the pilot."[14] He identifies the downsizing of the RAF post WWI as the main reason for having pilots fill most leadership roles (which were in addition to their flying responsibilities). However, there is no clear evidence to explain the lack of drive

[11] Allan D. English, "Leadership and Command in the Air Force: Can Non-Aircrew Command Flying Squadrons?" in *6th Annual Air Force Historical Conference Proceedings: Canada's Air Force from Peace to War*. (Office of the Air Force Heritage & History, 2000), 587.

[12] English, "Leadership and Command in the Air Force," 577.

[13] Allan D. English, "The Masks of Command: Leadership Differences in the Canadian Army, Navy and Air Force" in *The Operational Art: Canadian Perspectives, Leadership and Command.* (Kingston: Canadian Defence Academy Press, 2006).

[14] English, "The Masks of Command," 14.

for change once WWII was ramping up, other than navigators being accepted in key roles once pilot casualty rates began to rise. The post-WWI organizational and leadership construct had been accepted for good. No other writing has provided insight into decisions or conversations surrounding the RCAF adopting this same model or explaining why non-aircrew occupations were not considered for key leadership and ops positions.

English also discusses non-aircrew commanding flying squadrons in "Leadership and Command in the Air Force."[15] He concludes that non-aircrew are able to master the profession of arms to be credible leaders, but it "remains to be seen" whether or not non-aircrew can achieve the trust of their subordinates by sharing risk, without flying regularly on operations.[16] This chapter was left open-ended, and a study has not yet been conducted to validate the logic of this proposal in future operations.

A review of the available literature was carried out with the intent to determine if pilot selection criteria would also (automatically) select strong leaders. However, no evidence was found that drew a direct correlation. *Cream of the Crop* written in 2000 by English discusses the debate surrounding the RCAF's selection criteria for pilots during WWII, and whether or not Canada received the "cream of the crop" from its population.[17] The answer still remains unclear, and therefore evidence that pilot selection criteria was/is directly related to effective leadership remains to be seen.

Military doctrine such as *Leadership in the Canadian Forces: Conceptual Foundations* provides characteristics of effective military leaders, and English points out

---

[15] English, "Leadership and Command in the Air Force," 85.
[16] *Ibid.*, 85.
[17] Allan D. English, *The Cream of the Crop, Canadian Aircrew 1939-1945* (Montreal & Kingston: McGill-Queen's University Press, 1996).

that pilots get very little leadership training and experience before they reach the rank of Major. However, the literature does not identify the disparity between relying on mainly the pilot occupation to fill its key leadership and operations positions, and the inability for the RCAF to meet its full operational potential when limiting its most influential positions to a small pool of people. This study is therefore important because the future environment is complex and there is no research that analyzes whether or not the RCAF's current organizational and leadership construct is set up to meet the demands of future operations.

To highlight the tasks of the RCAF in future operations, this paper will use the *Future Air Operating Concept* (FAOC) from the Canadian Forces Aerospace Warfare Centre and Canada's defence policy, *Strong, Secure, Engaged*.[18]

Primary Research

This paper will draw examples and comparisons from several external sources. The passenger airline Air Canada will be used as a key source of information regarding efficiencies, key performance indicators, and measures of effectiveness, as it is an output-driven company. As part of the research for this DRP, the author carried out three weeks of observation that covered the company's Systems Operations Control (SOC) in Brampton, the maintenance hangar at Toronto Pearson International airport, and the Air Canada Headquarters (HQ) in Montreal over the period of April and May 2018. The aim of the internship was to understand the organizational structure of a civilian airline company, including its keys to success. Air Canada is "among the 20 largest airlines in

[18] Department of National Defence, *Future Concepts Directive Part 2: Future Air Operating Concept* (Ottawa: Royal Canadian Air Force, 2016) and DND, "Strong Secure, Engaged."

the world and serves more than 48 million customers each year."[19]According to its annual information form, "Air Canada's principal objective is to become one of the world's best global airlines."[20] In pursuing this goal, the company has dedicated considerable effort to improve its effectiveness and has developed ideas and initiatives that could potentially be beneficial for the RCAF. This will be discussed later in the paper.

Internal CAF examples will also be used as part of this study, including information from experience and conversations with individuals in several air force units. As well, the manner in which Health Care Admin (HCA) occupation and medical experts (i.e. doctors and nurses) are employed in specialist and management roles will be examined, as well as how other allied countries (i.e. UK and Australia) fill its key leadership and operations roles.

Aim and Methodology

As mentioned above, the aim of this study is to examine the long-standing rationale for pilots dominating the RCAF's leadership and ops positions. This will be done through an analysis of future requirements and a comparison with the current operations model of Air Canada, in order to recommend the best organizational and leadership model for the RCAF. The objectives of this paper are several, and are as follows:

- Understand the rationale behind a pilot-dominated RCAF and asses its validity in future operations;
- Determine the meaning and importance of leading from the front and sharing risk in a modern context;

[19] Air Canada, "Corporate Profile," last viewed June 1, 2018, https://www.aircanada.com/ca/en/aco/home/about.html.
[20] Air Canada, "2017 Annual Information Form," (19 March 2018): 5.

- Identify the requirements of future RCAF Operations, based on Government of Canada (GoC) priorities, the Defence Policy *Strong, Secure Engaged*, and the RCAF Future Air Operating Concept;

- Identify processes that make Air Canada operations efficient and effective, and determine which (if any) would be beneficially employed within the RCAF;

- Assess the prevalence of pilot bias within current ops centres;

- Determine skills required for effective leadership in the RCAF;

- Conduct a review of the employment of technical experts and managers in the CAF by comparing the RCAF with other CAF elements and allied forces; and

- Develop recommendations to demonstrate how widening the occupations considered for leadership and ops positions in the RCAF could contribute to an improved airpower output for the CAF.

Definitions and Assumptions

The following definitions and assumptions are provided as context for this paper.[21]

Aircraft Combat Systems Officer (ACSO) - This is the new terminology for the navigator occupation. However, this paper will use the term "navigator" for ease of referring to the occupation in previous as well as current context.

Navigators vs Pilots - While this paper refers to "pilots" filling most leadership and operations positions in the RCAF, it is understood that the Navigator (ACSO) occupation can be an exception to this, and in some rare cases, Aerospace Controllers.

Command and Leadership Positions - Command is the "the authority vested in an individual of the armed forces for the direction, co-ordination, and control of military forces."[22] Positions that are considered command roles in the RCAF include Officer Commanding a flight, Commanding Officer (CO) of a Squadron, Wing Commander, and RCAF Commander to name a few. Non-pilot occupations can occupy some of these positions (i.e. a logistics flight or a maintenance squadron), but currently positions with authority and responsibility over operational units and formations are limited to pilots (with some exceptions for navigators). There are other key positions in the RCAF that are generally limited to pilots, but are not considered command positions. These include management positions such as Deputy CO, or Chief of Staff, and operations (ops) positions such as Ops O of a Squadron (Sqn) or Ops O of a Wing. While these management and ops positions

[21] Additional definitions provided at Annex A.
[22] DND, Con*ceptual Foundations*, 8.

are not considered command positions, they are still key leadership roles within the RCAF. It is understood that the influence of leadership may also be exercised laterally, and upward in a military hierarchy.[23] Therefore, for the purposes of this paper, "key leadership" positions in the RCAF will refer to command, management, and ops positions that are responsible for exercising leadership over flying operations. "Key op positions" will refer to those working within an ops centre to oversee and coordinate flying operations.

Operations Centres – This will be a generic term used to describe ops centres within a Sqn as well as more robust centres such as the Combined Air Operations Centre (CAOC) within 1 Canadian Air Division. Note that "ops" will be the short form for "ops" centres as well as for operations.

Leadership and Organizational Construct/Structure of the RCAF – This expression refers to the pilot-dominance in key leadership and key ops positions in the RCAF. For ease of reading, this paper will often replace "leadership and organizational construct" with "model" or "construct" or "structure."

CHAPTER 2: HISTORICAL CONTEXT – THE CULT OF THE PILOT

The historical context surrounding military aviation provides the foundation for understanding original roles of air force personnel as far back as WWI. The following historical examples are important as they reveal the events and decisions that led to an eventual pilot dominated air force; the evolution Allan English refers to as the "cult of the pilot." These early influences would later form the leadership and organizational construct of the RCAF that exists today.

Canadians Recruited for the Royal Flying Corps (RFC)

Before the First World War, Canadians became enthralled with the 'up and coming' idea of airplanes and wanted to experience the thrill of aviation. Although the US was ramping up testing in early 1900s, Italy became the first country to use aircraft for military purposes during the Italian-Turkish war between 1911 and 1912.[24] Concurrently

[23] DND, Con*ceptual Foundations*, 9.

[24] Fabio Caffarena, "Air Warfare (Italy)," *International Encyclopedia of the First World War,* last modified October 8, 2014, https://encyclopedia.1914-1918-online.net/article/air_warfare_italy.

to the Italian use of aircraft for military purposes, WWI broke out in Europe. And as prominent WWI historian S.F. Wise noted, "an unconventional minority, in the opening months of the war, [Canadians] were so drawn to flying that they were ready to surmount many difficulties, including some put in their way by their own government, in order to try their wings."[25] At his point, Britain was heavily recruiting and almost anyone who wanted to serve as a pilot could do so as long as they could get a private pilot's licence, and were willing to be employed under British command.[26] Canadians soon left their homeland to fight with the Royal Flying Corps (RFC - later becoming the RAF).

Specialists Needed

Warfare became more advanced and technically complex throughout WWI, and as a result, its roles and rank structure also began to evolve. Early on, the RFC's role was to support the British Army by providing photo-reconnaissance and observation of enemy artillery using air balloons and aircraft (the saying "when the balloon goes up" still lives on today).[27] The observer, typically an artillery officer, would be in command of those flying missions.[28] However, these flights eventually evolved into aerial battles and low-level bombing missions, which inevitably changed the skill requirements of pilots. Pilots needed to become more specialized to counter the enemy threat, and therefore training became more robust, longer, and more demanding on pilot candidates. The standard flying training time of four hundred minutes [6.7 hours] in 1915-1916 was increased to incorporate new training that included cross-country flying, wireless systems, aerial

[25] S.F. Wise, *Canadian Airmen and the First World War, The Official History of the Royal Canadian Air Force Volume I* (Toronto: University of Toronto Press, 1980), 23.
[26] English, "Leadership and Command in the Air Force," 80.
[27] English Oxford Living Dictionaries, "When the Balloon goes up," last viewed June 1, 2018, https://en.oxforddictionaries.com/definition/when_the_balloon_goes_up.
[28] English, "Leadership and Command in the Air Force," p.80.

gunnery, and artillery integration.[29] The assignment of pilot ranks, traditionally ranging from Corporal to General Officer, was "more dependent on his social status than flying ability."[30] However, this was changing, and the occupation was transitioning to an all-officer corps.[31] Simultaneously, more formal flying training was being developed so that the RFC could better respond to the enemy threat.

In addition to refining the new capabilities for the RFC and its associated training, Allan English points out that new occupations also had to be created, in order to "complement the earlier technical occupations of riggers and fitters and the support trades like administration, motor transport and stores."[32] Some of the new trades included recording officers (doubling as intelligence), equipment officers, transport, armament, wireless, and magneto technicians, as well as aircraft gear mechanics.[33] This was the first indication that a large footprint would be necessary to sustain the more-advanced aircraft and equipment that was needed to combat a near-peer adversary.

The RFC did not have difficulty recruiting pilots in WWI, but this was not the case for ground crew. In 1916, while there was a "backlog of cadets eager [waiting] to begin flying training," the "real difficulty lay in finding the required numbers of ground tradesmen" as equipment and capabilities became more complex.[34] In fact, Lieutenant-Colonel Cuthbert H. Hoare, who was head of RFC Canada in Britain in WWI, "estimated the [RFC] needs at some three thousand skilled tradesmen, if the full complement of twenty training squadrons and their supporting units was to be achieved. Engine fitters

---

[29] Wise, First World War, 40 and 85.
[30] English, "Leadership and Command in the Air Force," 80.
[31] Hugh A. Halliday, "The NCO Pilots: Air Force, Part 11," *Legion Canada's Military History Magazine,* last modified September 1, 2005, https://legionmagazine.com/en/2005/09/the-nco-pilots/ and Wise, First World War, 38.
[32] English, "The Masks of Command," 14.
[33] English, "Leadership and Command in the Air Force," 14.
[34] Wise, First World War, 76-77, 84.

and riggers were most wanted, but altogether the RFC needed men in more than twenty skilled trades."[35] Due to the required new specialties, "technical and support trades developed their own officer and NCO corps that were responsible for overseeing the technical expertise necessary to keep the flying services operational."[36] The new level of technical support and operations coordination that was required to keep aircraft flying was significant.

Eventually, the RFC was successful in recruiting ground tradesmen from Canada, mustering approximately six thousand new recruits from its offices in Toronto, Hamilton, Montreal, Winnipeg and Vancouver.[37] The new and complex way of war also meant that new trades and specialities were essential for the RFC to maintain its competitive edge against the enemy. By the end of WWI, the RFC had increased its establishment from "2,000 men in 1914 to 290,000 men and women in 1918."[38] Of the 290,000 personnel, only 5% were flying positions.[39] This composition is important as it demonstrates the level of technical expertise and support that was required to sustain the RFC/RAF aircraft and its associated capabilities.

Loss of the Specialist, Rise of the Generalist

In November 1918, WWI was over and the RFC (now the RAF) was commencing a drastic reduction plan. At that time, Canadians accounted for approximately 20,000 personnel serving with the RFC, including 2,539 pilots, 16,663 cadets/mechanics/support

---

[35] Wise, First World War, 76-77, 84.
[36] English, "The Masks of Command," 15.
[37] Wise, First World War, 84.
[38] English, "The Masks of Command," 15 and Denis Winter, *The First of the Few: Fighter Pilots of the First World War* (London: Penguin, 1982), 110-120.
[39] Wise, First World War, 593 and Chris Bowyer, *History of the RAF* (London: Hamlyn, 1977).
At the end of the war there were 5,182 pilots in service (just 2% of the RAF). In comparison, the casualties from the RFC/RNAS/RAF for 1914–18 totaled 9,378 killed or missing, with 7,245 wounded. Snook notes that the number of pilot positions would have been closer to 5% if the number of empty positions due to casualties were included.

personnel, and 85 observers.[40] The composition of the Canadian contribution was close to 13 percent pilots and 87 person non-pilot trades.[41] When the downsizing plan was activated most specialists (such as equipment officers or engineers) and support trades were discharged and the officer corps remaining was made up of mostly pilots.[42] This was done by the RAF "to ensure as many of them as possible were available to fly in the minuscule air forces of the inter-war years."[43] It was felt that with minimal positions available in the RAF, pilots would have to fill both flying and non-aircrew roles, such as armament, photography and navigation, to satisfy all essential tasks and maintain core flying competencies. It was this decision that led to pilots becoming "general duties" officers.[44] This result was a key turning point in the history of the RAF: the shift to a pilot-dominated air force Allan English refers to as the beginning of the "cult of the pilot."[45]

At the end of WWI, Sir Hugh Trenchard was the commander of the RFC in the field, and played a significant role in ensuring that the resulting structure of the RAF would become permanent.[46] He felt that pilots should do much more than fly aircraft, and famously brought this point to the attention of American officers who were visiting RFC Canada in 1917. He stated that a pilot "was not a flying chauffeur" but a "modern cavalry

---

[40] Bill March, "Military Aviation Training in Canada."
[41] Estimate based on 22,000 from English, "The Masks of Command and 5,182 number in Chris Bowyer, *History of the RAF* (London: Hamlyn, 1977).
[42] English, "The Masks of Command," 15. Note that pilots were all officers at the end of WWI.
[43] *Ibid.,"* 15.
[44] W.A.B. Douglas, *The Official History of the Royal Canadian Air Force*, vol. 2, *The Creation of a National Air Force* (Toronto: University of Toronto Press, 1986), 145.
[45] English, "The Masks of Command," 15.
[46] The National Archives, Ministry of Defence, "Trenchard: Father of the RAF," last modified April 2, 2008, http://webarchive.nationalarchives.gov.uk/+/http://www.mod.uk/DefenceInternet/DefenceNews/HistoryAndHonour/TrenchardFatherOfTheRaf.htm.

officer."[47] Trenchard, a former cavalry officer himself, was potentially trying to illustrate a point that a pilot's role should incorporate more than his responsibilities inside the cockpit, and should extended to a roles that include leading people and coordinating operations.

As the RFC/RAF was experiencing the rise of pilots as general duties officers (or generalists) Canadians were witnessing the new organizational structure take shape. As English notes, Trenchard, who later became the Chief of the Air Staff in the RAF, "enforced his wartime dictum on his Canadian protégés that pilots would fill virtually all command positions."[48] Pinpointing the origins of this mind-set is important, as it becomes clear that Trenchard's influence was likely the most significant contributor ro the RCAF's organizational structure that exists today.

British influence on Canadian airmen and airwomen during the WWI years can be seen in several places. Two Canadian Squadrons were established in England while Trenchard was in command, and the RFC had a presence in Canada.[49] Britain established "RFC Canada," which was a headquarters (HQ) in located in Toronto in 1917 that was responsible for managing several Squadrons formed to support flying and technical training.[50] In 1918 for example, Camp Borden in Ontario was the first RAF Canada

---

[47] This point was brought to the attention of American officers during a May 1917 visit to RFC Canada, where they were told that the pilot was not a "flying chauffeur" but a "modern cavalry officer" or a "knight of old." Hiram Bingham, *An Explorer in the Air Service* (New Haven, CT: Yale University Press, 1920), 16–17.

[48] English, "The Masks of Command," 15.

[49] Bill March, "A brief timeline of military aviation training in Canada," *Royal Canadian Air Force*, last modified August 10, 2017, http://www.rcaf-arc.forces.gc.ca/en/history-heritage/royal-flying-corps-canada/timeline.page.

[50] *Ibid.*

Flying station.[51] Post WWI, many of the Canadian wartime pilots who were transferred back to Canada and were also key players in building a new Canadian air force.[52] The RFC/RAF influence on Canadian airmen and airwomen is undeniable.

Literature does not specifically provide the reasons that Canada later stood up an air force with a similar leadership and organizational model in 1924. However, a historical review certainly indicates that the RAF had a significant influence over Canadians during the WWI years, which likely resulted in the pilot-dominated RCAF model that still exists today.

Interwar and WWII: Specialists and Generalists

When WWII broke out in 1939, it was evident that the RCAF would need to boost its numbers in technical and support trades in order to sustain a war effort. This was a clear lesson learned by the RFC in WWI. RCAF history indicates that, "technical [i.e. mechanics and engineers] and flying training continued at Borden throughout the 20s and 30s and culminated during WWII under the British Commonwealth Air Training Plan."[53] The expansion saw numbers increase from 1,150 in 1938 to 206,350 in 1943 (46, 272 of them serving overseas).[54] This growth included an increase in the NCO trades that had been diminished post WWI.[55]

Although technical and support trade numbers increased to support the war effort, pilots continued to fill most of the major leadership and operations roles as they did in the

---

[51] Department of National Defence, "Canadian Forces School of Aerospace Technology and Engineering (CFSATE) History," *Royal Canadian Air Force*, last modified July 5, 2018, http://www.rcaf-arc.forces.gc.ca/en/training/cf-school-aerospace-technology-engineering.page.

[52] Department of National Defence, "RCAF Celebrates 93 years of service," *RCAF*, last modified July 6, 2018, http://www.rcaf-arc.forces.gc.ca/en/article-template-standard.page?doc=rcaf-celebrates-93-years-of-service/j0ts9pds.

[53] DND, "CFSATE History."

[54] English, "The Masks of Command," 82.

[55] *Ibid.,"* 83.

inter-war years.[56] The pilot role remained a "general duties" officer, as per the vision of Sir Trenchard post WWI. However, when aircrew casualty rates became concerning in WWII, some exceptions were made. English states that by about 1942:

> The high loss rates and trouble finding enough good leaders among the pilots led to a fierce debate in the RAF and the RCAF over whether other aircrew trades could command squadrons and flights. Necessity provided the answer, and soon enough a few wireless-operator air gunners and other aircrew trades were given command positions.[57]

Allowing other aircrew trades (i.e. navigators) to carry out leadership functions was likely beneficial in preserving airpower. This exception would have allowed for more pilots to remain proficient in flying by continuing to solely carry out their flying duties, and build specialized training that was needed for combat. However, the opening up of positions to other aircrew trades was the extent of the exception, and for the most part, the "cult of the pilot" remained.

The specialist skills required for pilots ('hands and feet') to maintain an edge over the adversary became more and more evident throughout WWII. RAF and RCAF pilots began to be trained in formation flying. At the beginning of the war for example:

> Pilots were trained to fly in close formations, either V-shaped or lined-up. When a target was located, an enemy bomber for instance, the fighters would try to sneak up on it…The formation had to be maintained at all times: upon the squadron leader's signal they would all together dive on to the target, taking turns at firing.[58]

However, when the Battle of Britain took place in 1940, it was demonstrated that maintaining the flight formation when attacking was dangerous because pilots had to constantly monitor what the other aircraft were doing and the formation became an easy

---

[56] English, "The Masks of Command," 83.
[57] *Ibid.,"* 16.
[58] Juno Beach Centre, "*Canada in the Second World War - Fighter Formations*," last viewed May 15, 2018, https://www.junobeach.org/canada-in-wwii/articles/rcaf-fighter-squadrons-overseas/fighter-formations/.

target.[59] Formation flying continued to be used for safety and escort reasons, but "looser" formations of 2-4 aircraft were later adopted as it provided more flexibility and reduced chances of being targeted.

Formation flying provides an example of the specialism that was, and still is, required of pilots. Although formation flying is no longer used as a way of 'charging into battle,' it is still employed as tactic in operations, such as the CF-188 conducting blocking exercises as part of Operation Reassurance in Lithuania.[60]

Streamlining pilots into ground positions to fill "general duties" or key leadership jobs, can potentially take pilots away from honing these types of complex skills. The same could be said for other technical trades, such as engineers, but pilots are significantly more specialized, and require substantial training to maintain currency and relevance. A concern with the current setup of having pilots in most key ground positions is that is that it can create unrealistic expectations. Although not impossible, it can be extremely challenging for pilots to be effective in key leadership positions and still maintain a high level of technical flying proficiency. When individuals are split between two extremely important functions at the same time, it does not set the Air Force up to reach its maximum potential, or to deliver optimized outputs. This model will become even more challenging, as operations become more complex and demand more from individuals.

Conversely, the balance of generalists and specialists looks somewhat different in a HQ environment. Pilots who are transferred to HQ positions (i.e. 8 Wing Trenton or 1

---

[59] Juno Beach Centre, "Fighter Formations."

[60] Department of National Defence, "Fighter Jets," last modified December 13, 2017, http://www.forces.gc.ca/en/business-equipment/fighter-jets.page.

Wing Kingston) are not necessarily expected to maintain a high level of proficiency outside of his or her minimums, which allows them to focus on the staff job at hand. This placement provides significant benefit to the RCAF overall, as these individuals can provide expertise on flying matters to other staff personnel and senior commanders who may not been recently exposed to air force operations. This is one of the reasons that a pilot-dominated air force has been reinforced over time. However, balance is key.

In some cases the 'right person for the job' may be a pilot and other times it may be a non-pilot. The selection should be based on the individuals' experience and leadership abilities as well as the expectation of flying requirements at the time. This would create balance.

Resource Constrained RAF leads to Permanent RCAF Structure

The RCAF experienced the rise of speciality occupations and trades in WWI, and added "general duties" roles to the pilot occupation post WWI. The model of having pilots in most key leadership and ops positions has not changed, but new trades and occupations have augmented the RCAF. Today, the RCAF is made up of 4,034 officers and 8,338 Non-Commissioned Members (NCMs), with the officers divided into 16 occupations.[61] Of these 4,034 officers, pilots account for 1287 (32%); yet occupy almost all of the key leadership and operations positions in the RCAF.[62] Although this statistic is not specifically tracked, it can easily be seen with a snapshot of the tactical and operational, and levels within the RCAF.

---

[61] Info provided by D Mil C 6-3 Career Manager Air Logistics (7 June 2018); See Annex A for list of officer occupations.

[62] Info provided by D Mil C 4 - Rotary Wing (Pilot) Career Manager (22 May 2018) and D Mil C 6-3 Career Manager Air Logistics (7 June 2018). Author requested information from D Mil C to quantify the number of leadership and ops positions, however data does not separate which pilot-designated positions are flying or ground positions.

Within the 1 Wing helicopter community for example, pilots occupy all Operations officer (Ops O) positions, Commanding Officer (CO) positions, and in most cases (5/6), the Deputy CO positions within the flying Squadrons.[63] At the Wing HQ level, the Ops O, Chief of Staff (COS), and the Wing Commander are also pilots. At 14 Wing Greenwood for example, the Ops Os, COs, DCOs, and the Wing Commander are also pilots (with the exception of a few navigators).[64] This snapshot provides examples from two RCAF communities to demonstrate the level of pilot representation in key leadership and ops positions across the tactical and operational levels.

This was the organizational construct that resulted from post-war financial constraints that had pilots carrying out multiple roles in the RAF. To note, there was also no requirement for an optimized air force during the twenty-year inter-war period. Technical and support trades could be reduced without significant impact and pilots were multi-roled so that all leadership and operations requirements would be met, in a 'do more with less' approach. As a result of the pilot-dominated RAF from 1918, and influencers like Sir Hugh Trenchard, the model became permanent, and was replicated by the RCAF when it stood up in 1924.

In 2018, the RCAF continues to emphasize selecting officers of the pilot (and navigator) occupations to lead in most key operational positions at the tactical and operational levels. However, one of the main arguments used to reinforce this notion is potentially based on legacy warfare and may be limiting the operational output for the RCAF.

[63] Units verified were: 403, 408, 427, 430, 438 Sqns.
[64] Units verified were: 405, 413, 404 Sqns.

CHAPTER 3: LEADING FROM THE FRONT AND SHARING RISK

Analyzing the history of the RCAF was extremely important as it provided the context of how the "cult of the pilot" was developed in the RAF during the resource-constrained interwar years, and how it remained in effect after WWII. It was reinforced throughout history that pilots should not only fly aircraft but should also lead the Air Force by occupying most of the Air Force's key leadership positions. This chapter will assess the validity of the 'leading from the front' notion by assessing the evolution of this concept within the Army and comparing its application in RCAF today.

Leading from the Front – the Army's Evolution

The expression 'leading from the front' describes a concept that is generally understood by the CAF writ large, but its meaning today looks much different than it did in WWII for example. The term was derived from army commanders as far back as Alexander the Great, leading troops into ground battle at the front line, the position closest to the enemy and the action in battle.[65] The requirement for this physical position in the early days of war is well-illustrated by the British cavalry in WWI. Due to limited communication means in the early 1900s, commanders had to be in the front of their men, carrying out soldier skills, to understand and appreciate the battlefield to make informed decisions. Leading from the front was also a significant aspect of motivating soldiers to charge into battle in terrifying situations. In reference to the physical position of the front, British General Officer Commanding the 1st Cavalry Division during WWI, Major-General Mullens, stated that "time does not admit of sending the information back to the rear and for re-transmission to the front…the leading Cavalry Division should be

[65] Project of History of Macedonia, "Alexander the Great," last viewed June 15, 2018, http://www.historyofmacedonia.org/AncientMacedonia/AlexandertheGreat.html.

given the plan and should be allowed to carry out the task allotted in the best way that offers."[66] Therefore, individuals with key decision-making powers essential to these large-scale operations had to be physically located at the front line in order to effectively lead.

Towards the end of WWI however, the use of cavalry was considered to be obsolete with the rise of technology. David Lloyd George, the Prime Minister of the UK perpetuated "the notion that cavalry had no place on the modern battlefield, and painted the evocative and tragic picture of the doomed cavalry charge wherein mounted troops were rapidly cut down by machine gun fire and their objective later captured by the infantry."[67] As weapons became more advanced and machine-guns more prevalent, sending cavalry into battle was no longer tactically advantageous. It was extremely dangerous and the chances of winning the battle with cavalry were low. This example demonstrates the significance of technology in the evolution of warfare. Tactics and operating procedures must always be adjusted to meet new threats and mission requirements.

In addition to the physical risk of sending commanders, soldiers, and cavalry into battle, new enemy capabilities were added to the battlefield, including weapons with increasing range. This meant that allied forces had to change their tactics to avoid enemy fire by conducting more dispersed operations, avoiding a concentration of forces at the front line. As operations became more dispersed, it became significantly more challenging for commanders to direct the battle from the front and within. Commanders

---

[66] Stephanie E. Potter, "Smile and Carry On: Canadian Cavalry on the Western Front, 1914-1918," *The University of Western Ontario,* last modified April 2013, https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=2544&context=etd.

[67] *Ibid.*

had to move to the rear in order to maintain full situational awareness through observing the full battle, and direct as required.

At the same time, when operations became dispersed, reliable means of communication had not yet been established:

> Orders and battle plans had to be relayed to thousands of men across hundreds of miles of frontline. This made it impossible for commanders to lead from the front and communicate properly at the same time. By 1914, radio and telegraph were established technologies, and provided the most efficient means for generals to communicate with their armies. But these technologies were based on wire, and were of little use when men went over the top of their trenches to attack the enemy. The most reliable ways of getting messages back to headquarters were runners, and the traditional carrier pigeon.[68]

It was evident that commanders now had to be located physically at the rear to be effective, but communications were not yet enabling decision-making. The introduction of tanks by the British army in 1916 again demonstrated how the lack of radios, "hampered the flow of information to commanders at the rear."[69] The transition was not seamless. The allies were able to advance through German defence lines with the small number of tanks they had, but "a lack of communication (they had no radios) and lack of coordination with infantry and artillery stalled the attack."[70] Things slowly improved and by 1918, and "primitive radio was appearing on the battlefield. But thousands [had already] lost their lives because those in command often had to make decisions based on missing or incorrect information."[71] This example demonstrates the need for commanders

---

[68] BBC News, "Has History Misjudged the Generals of World War One?" last viewed June 15, 2018, http://www.bbc.co.uk/guides/zq2y87h.

[69] Historica Canada, "Battle of Vimy Ridge," last viewed June 15, 2018, https://www.thecanadianencyclopedia.ca/en/article/vimy-ridge/.

[70] Christopher Woolf, "The Day Tanks Changed War Forever," *Public Radio International (PRI),* last modified September 15, 2016, https://www.pri.org/stories/2016-09-15/day-tanks-changed-war-forever.

[71] Christopher Woolf, "The Day Tanks Changed War Forever."

to be able to communicate with all elements within the operation, rather than just those physically around him or her.

While the expression ‘leading from the front’ was once used to describe commanders leading the charge of soldiers at the front line (because that is where they were most effective) they were now able to better influence the battle at the rear with integrated communications. This change had to be made by the army to ensure the organization was best set up for mission success. The full potential of this setup was later realized with the development of integrated army operations centres, where the commander could observe; collect information, coordinate, and direct operations. To substantiate this theory, the Army’s “Waypoint 2018” employment concept indicates that “the army’s ability to accomplish assigned missions” is a direct result of the functionality of command and control.[72] Usually this happens from a tactical operations centre or a command post far back from the ‘front line’ that enables him or her to have accurate real-time information.

The Army’s application of ‘leading from the front’ could also be described as ‘leading where most effective’ in a modern-day context. The concept was originally defined as ground commanders demonstrating soldier skills in the face of the enemy, sharing battlefield risk, and coordinating and leading the operation from the front lines. Army COs will still train to lead a full infantry battalion into battle, but the likelihood of this occurring in modern operations today is extremely rare. The threat and environment has dictated the need for more dispersed operations (i.e. counter insurgency) and coordination from the rear in an ops centre. And in many ways, the necessity for

[72] Department of National Defence, “Waypoint 2018: The Canadian Army Advancing Toward Land Operations 2021,” Canadian Army Land Warfare Centre (2015): 58.

commanders to be expert tacticians has been replaced with the requirement for commanders to understand the entire army operation (outside of the commander's traditional scope) and communicate and coordinate joint and combined operations.

Liddell Hart also explained the theory that 'leading from the front' by demonstrating solider skills in the face of the enemy was no longer a viable option in war. He stated:

> Courage and skill are of little avail against a superiority of machinery. The bomber has extended the de-humanizing effect of artillery, the flying bomb and the rocket bomb carry it a stage further. These automatic weapons make nonsense of the soldierly idea that success in war is a proof of a people's virility and virtue.[73]

Future operations will be discussed further in the next chapter, but the important point to highlight is that while the army has evolved its approach to 'leading from the front' in order to effectively respond to modern warfare, the Air Force has not evolved at the same pace.

Leading from the Front – A Comparison with the Air Force

Towards the end of WWI, without a change in approach for the RAF, "aggressive lead from the front tactics in the air meant high casualties among squadron and flight commanders."[74] As a result of recurring casualties, there was minimal key leadership left in the RAF to lead operations, and junior pilots without leadership experience had to take on key leadership roles. English points out that "by April 1917, the crisis was so great that squadron commanding officers were forbidden to fly within five miles of enemy lines."[75] This created personal dilemmas for commanders because they felt that they

---

[73] B.H. Liddell Hart, *The Revolution in Warfare* (London: Faber and Faber, 1947), 81-82.
[74] English, "Leadership and Command in the Air Force," 81.
[75] *Ibid.,"* 81.

should continue to share the risk of dangerous missions with their pilot subordinates, so they continued to do so. As a result, the organization was left with almost no one to lead operations.

By the end of the war, the situation was so dire that "some senior army officers with little or no flying experience but skilled in the handling of men were assigned to command some squadrons."[76] This was required due to the lack of leadership that remained in the RAF.[77] Younger pilots who were not yet Majors had little to no training or experience in leading airmen, and could not lead an organization. There was no question that strong leadership measures were necessary. Since this time other than incorporating navigators in some leadership roles, the concept of 'leading from the front' has only minimally evolved for the RCAF.

Into WWII commanders continued to lead operations by physically placing himself/herself in front of other allied aircraft into air battle. However, some changes can be noted today. Similar to the army, air force commanders no longer lead entire Squadrons of aircraft into battle as they once did in WWI and WWII, as aircraft now deploy in smaller dets i.e. 2-ship or 4-ship groups in dispersed operations. The requirement for air force officers in key positions to be immersed in day-to-day flying operations to become 'experts,' has been replaced by the requirement for commanders to maintain situational awareness and understanding of the entire operation, in order to make effective decisions. Traditionally, pilots were best able to do this since they could pilot an aircraft to gain this appreciation of the battle space and the risk involved. This practice is still useful, but is not the only way to gain understanding of operations and

[76] English, "Leadership and Command in the Air Force," 81.
[77] *Ibid*.," 81. Note that although other officer occupations remained in the Sqn i.e. armament, engineers, support etc. it is not clear in historical documentation why these officers were not considered for command.

risk. Of course there is still a need to have flying expertise in some leadership positions (i.e. unit tactical flying standards officer) but it is not necessary for all key leadership roles at the tactical and operational levels to be filled by pilots. Commanders can achieve awareness through 'ride-alongs' visiting certain sites and communicating with aircrew. And since ops are more complex today, listening/communicating live with all elements of the organization is critical. Fortunately this can be done today with live feeds and multiple sensors.

Subordinate trust in leaders, of course, remains critical in organizations that have unlimited liability. In the modern definition of 'leading from the front,' leaders must still be able to demonstrate competency, share risk, and effectively coordinate and manage operations.

Sharing and Understanding Risk

It remains important for army and air force leaders to demonstrate competency through performance in their occupation and/or effectively coordinating and managing personnel and resources within an organization. Additionally, leaders must also demonstrate their willingness to share risk, commonly referred to as 'leading by example,' in militaries today. The CAF defines leading by example as "sharing risks and hardships and refusing to accept or take special privileges."[78] Sharing risk could involve ride-alongs in the field with subordinate army commanders (or pilots), sleeping in the field with subordinates, or travelling to areas of conflict for additional situational awareness. However, if the presence of the commander in these situations increases risk to personnel or is detrimental the organization it should be avoided.

[78] DND, Con*ceptual Foundations*, 73.

Through examples within the British RAF in WWI it was understood that commanders felt they had to demonstrate their flying competency and share the risk of dangerous flying missions with their subordinates, even through this sometimes came at a cost to the organization. This mindset was migrated over to the RCAF and can sometimes be seen today, hence the pressure on pilots to maintain flying proficiency while in non-flying positions and the requirement in the Flight Operations Manual for Wing commanders to "fly regularly," including on overseas operations.[79]

There may be some reservations amongst some junior pilots with regards to being directed to conduct certain missions by individuals who may not be able to carry out the same duty (i.e. a non-pilot Ops O directing flying operations). Therefore, it is critical for those leaders in the RCAF to demonstrate a strong understanding of risk in operations. To do this, non-pilot leaders must be able to gather all available information from flying experts, intelligence, logistics, maintenance, and signals etc to make decisions that are as informed as possible. Depending on the mission (i.e. HA, SAR, combat) different aspects of the operations will vary in focus. In future operations, relying on leaders to make decisions based solely on their own trade expertise, will become more difficult and less effective, as new capabilities are added to the mix and operations grow in complexity.

With a wide range of new capabilities being operated by a small force, no one person will have all of the answers, and must rely on expertise from subject matter experts. Liddell Hart compared to this responsibility to "managing a vast department store" in that you must be able to manage the overall organization, relying on the experts

[79] Department of National Defence, *RCAF Flight Operations Manual* (Ottawa, 2017), 613.

in each department.[80] General Stanley McCrystal further discusses this idea in his book *Team of Teams.* He states that when he took over as the commander of the US Joint Special Operations Command Forces he needed to change how its operations teams were built in order to improve the organization's outputs. To maximize effectiveness the goal was to "fuse generalized awareness with specialized expertise."[81] In other words, in the fast changing pace of operations, decisions have to be built upon the combined expertise of the team. Therefore, it is less important to have someone leading and attempting to make decisions based upon their own experience, but more important to have a leader that can consolidate all aspects of the operation and make the best decision for the organization.

For leaders to understand risk, they must also have a grasp on the other functions/trades within the RCAF. The army provides a five-month, in-depth operations course to captains to do exactly that. The new six –week Airpower Operations Course (APOC) does not currently provide the same depth of knowledge for air force operations, but is a step in the right direction. For non-pilot occupations to apply their leadership and management skills to best benefit the RCAF, a better cross-functional air force course should be provided. This will also allow non-pilot occupations to have the required knowledge of the flying operations. The RAF and the Royal Australian Air Force (RAAF) have already demonstrated that this knowledge can be learned without flying background and will be discussed later in this paper.

---

[80] B.H. Liddell Hart, H*istory of the First World War* (London: Pan Books, 1972), 32.

[81] Stanley McChrystal, Chris Fussell, Tantum Collins, and David Silverman, *Team of Teams: New Rules of Engagement for a Complex World (*Portfolio: Penguin Books USA, 2015).

Risk can also learned and understood via different means outside of direct operations. For example, logistics officers understand the criticality of providing clean fuel to aircraft and engineers understand the impact of making a wrong airworthiness decision. These pressures always exist for non-pilots in the RCAF.

Looking to Air Canada for comparison, the company is responsible for the safety of hundreds of thousands of passengers everyday. While RCAF has to consider the possibility of an aircraft getting shot down over an active theatre, Air Canada has to consider the risks associated with flying 48 million passengers of all walks of life to/over nearly every country in the world in a daily basis. One aircraft, such as the Boeing 777, can carry up to 400 people on one flight, sometimes in less than ideal conditions (i.e. bad weather, volcanic ash, busy airspace) and potentially contested airspace, as we saw with Malaysian Airlines flight 17.[82] Cyber hacking and terrorism are, of course, also very real threats for an airline. To ensure the safety of its passengers, Air Canada has to ensure that personnel, who are placed in positions of authority, are able to understand and share these risks. Key executives in the company may not be pilots, but they are expected to have 'ground-level' understanding of operations, and are expected to fly with the airline so that they maintain an appreciation for the operation to better enable decision-making.

Through historical examples, it is clear that subordinates trust leaders when they 'lead from the front.' However, the air force must evolve its thinking to realize that if taken out of context, this concept can be detrimental to the organization. In a modern scenario, leading from the front can be achieved by individuals with strong leadership

[82] Editorial Board, "A Step Closer to the True Story of the plan shot down over Ukraine," The Washington Post, last modified May 26, 2018, https://www.washingtonpost.com/opinions/a-step-closer-to-the-true-story-of-the-plane-shot-down-over-ukraine/2018/05/25/e8396ca2-6043-11e8-b2b8-08a538d9dbd6_story.html.

abilities who demonstrate competency, share and understand risk, and effectively manage personnel and resources.

The Trenchard Irony

There are no official accounts of how morale was affected amongst the RAF when senior army officers had to lead pilots and airmen. But there is evidence of a highly regarded officer leading the RAF, who had no operational or combat flying experience. Sir Hugh Trenchard, who was widely known for his performance commanding the largest part of the RFC in the field during the war, fits this description.[83] He completed pilot training in 1912 but had never served as a pilot. There are several ironies here.

Trenchard's leadership abilities were developed through his twenty years in the army, which enabled him to lead a large portion of tthe Air Force just five years after joining. Yet he was a driving force behind reserving key leadership positions for pilots, whom he believed had the right leadership abilities to dominate the Air Force. Trenchard however, knew very little about pilots' abilities, their training, and their level of leadership.

At forty years old, Trenchard was awarded a pilot certificate after sixty-four minutes in the air.[84] Following this he did not carry out further training, nor was he sent to fly in war like most other pilots in the Air Force. It was felt that he was better suited as a staff officer based on his age and former experience. Trenchard had never served as a pilot but his attributes and leadership abilities enabled him to effectively lead the RFC/RAF.

---

[83] English, "The Masks of Command," 9 and English, "Leadership and Command in the Air Force," 81.
[84] The National Archives, "Trenchard: Father of the RAF."

In 1917 the Trenchard logic of comparing pilots to a "modern cavalry officer" is what led to his belief that pilots should carry out most leadership roles in the RAF.[85] His ideology may have been based on his feeling of what a pilot 'should be,' similar to his own experience as a cavalry officer, rather than the reality. The skills developed by a cavalry officer in WWI would have been significantly different than those of flying pilots. Based on his little experience of the Air Force at that time, he may not have had a full appreciation of the lack of leadership training and exposure that pilots were getting. Furthermore, it was around the same time that the use of cavalry (in its most traditional soldier-horse role) had become obsolete in the army. Trenchard's logic of comparing cavalry with pilots was flawed from the start. As a result, the RAF and later the RCAF built a structure that limited other occupations from occupying key leadership and ops positions for the next 100 years.

A review of Trenchard's career demonstrates that to effectively lead air force operations, flying experience is not necessarily essential. His judgement and leadership skills were transferred directly from the army and enabled him to successfully grow the RFC from 83 aircraft to 22,000 over the course of WWI.[86] It was also written in the Times paper that "if Trenchard had not taken up flying when youth had already passed him, the RAF would not have been the bulwark of Britain that it was in either world war."[87] In other words, ironically, his skills learned from early leadership training in the army significantly contributed to the RFC's success in WWI.

---

[85] This point was brought to the attention of American officers during a May 1917 visit to RFC Canada, where they were told that the pilot was not a "flying chauffeur" but a "modern cavalry officer" or a "knight of old." Hiram Bingham, *An Explorer in the Air Service* (New Haven, CT: Yale University Press, 1920), 16–17.

[86] "Leadership and Command in the Air Force," 81.

[87] Time, *The Weekly Newsmagazine*, 11 Feb (1956) and Time, *The Weekly Newsmagazine*, 22 Feb (1956).

CHAPTER 4: CURRENT AND FUTURE OPERATIONS: NEW WARFARE, OLD STRUCTURE

The previous chapter provided an introduction to the concept of 'leading from the front' and discussed how the army's application of the concept has evolved. When this analysis was compared against the RCAF's use of 'leading from the front,' the lack of progression for the air force quickly came to light. The following chapter, *Current and Future Operations,* will highlight the challenges associated with employing legacy ideologies in today's unpredictable and complex security environment. The effectiveness dimensions of "internal integration" and "external adaptability," from *Conceptual Foundations* will also be referenced throughout, in order to highlight their applicability in future operations.

Evolution of RCAF Operations WWII to Present

The US Foreign Policy Research Institute defines warfare as the "conduct of war" and further explains that "technology shapes warfare."[88] Understanding the difference between war and warfare is important to set the stage for this chapter, because the following examples outline how the RCAF has evolved its warfare practices since WWII. As new capabilities and technologies are developed, warfare also changes, shaping how wars are fought and how a military force will respond; separate from the condition of war itself.[89] These activities are what military forces call operations. Therefore, as technology advances, warfare (or operations) will inevitably evolve.

WWI saw the evolution of aviation from a means of artillery observation to aerial battles and low-level bombing. Twenty years later, during WWII, the RCAF flew

[88] Alex Roland, "War and Technology," *Foreign Policy Research Institute*, last modified February 27, 2009, https://www.fpri.org/article/2009/02/war-and-technology/.
[89] Roland, "War and Technology."

bomber, fighter, reconnaissance transport, and other missions around the world.[90] The technical skills required from pilots and trades personnel became significant in order to enable the types of missions that Canada had to support. For example, the RCAF fighter-bombers "attacked coastal areas in German-occupied Europe while Canadians heavy bombers struck at targets much further inland. [And] Canadian maritime patrol bombers based in Canada, Newfoundland, Iceland and Britain fought German submarines."[91] Tactics were used that included precision bombing "aimed to destroy the enemy's war-making base," such as industrial buildings and factories.[92] These tasks alone involved enormous training requirements as well as large scale technical and support footprints. WWII revealed that warfare was no longer limited to opposing armies, as civilian populations and symbolic targets were brought into the fold. This was obviously the final blow that ended WWII in 1945, when allied forces employed the atomic bomb to defeat the Japanese. As Liddell Hart indicated, over time, airpower had truly "emphasized the mechanical trend of warfare" and airpower had forever changed.[93]

The CAF defines airpower as "that element of military power applied within or from the air environment to achieve effects above, on, and below the surface of the Earth."[94] The next few paragraphs highlight that this 'power' took on new meaning again for the RCAF after WWII. Operations began to include those which provided non-combat effects, such as Humanitarian Assistance (HA), peace support missions, and Non-Combat Evacuations (NEO), rather than solely traditional missions such as bombing and

---

[90] Canadian War Museum, "The Royal Canadian Air Force," *Canada and the Second World War,* last viewed June 15, 2018, https://www.warmuseum.ca/cwm/exhibitions/chrono/1931rcaf_e.shtml.
[91] Canadian War Museum, "The Royal Canadian Air Force."
[92] *Ibid.*
[93] Liddell Hart, Revolution in Warfare, 27.
[94] DND, Canadian Forces Air Doctrine, 18.

air interdiction. This changed the types of tasks that the RCAF had to carry out. It was no longer as simple as 'country on country,' but became more complex as operations included civilian populations, other government departments, and offered less clarity on 'who' the enemy was. Flying was an important aspect of the mission, but it was not the entire focus. These new types of operations started to reveal that pilot training did not provide the necessary skills that were essential for leading these types of missions. This concept will be further examined in the *Leadership and Technical Ability* chapter.

RCAF Operations continued to look different than combat for more than 45 years after WWII.[95] In 1990, Canada's CF-188 fighter jets were sent to Europe to aid the US in Operations Desert Storm and Desert Shield during the First Gulf War, to serve as "part of the Coalition of countries that came together to drive the invading forces of Iraq out of Kuwait."[96] The RCAF also had to introduce new capabilities and skills that included combat air control, escort and reconnaissance, and air-to-surface attacks to counter new threats.[97]

Throughout the 1990s, the RCAF continued to provide non-combat effects such as HA in Haiti and Honduras and peace support operations Kosovo and Africa to name a few. As a result of Canada's contributions, mainly in the 1990s, the country gained a peacekeeping reputation around the world.

After Desert Storm and Desert Shield in 1991, the next combat mission the RCAF participated in was eight years later in 1999 when CF-188s carried out air strikes against

---

[95] CBC News, "A history of Canada's CF-18 Hornets," last modified March 2, 2017, http://www.cbc.ca/news/canada/cf-18-hornets-1.1003648.

[96] Veterans Affairs Canada, "The Canadian Armed Forces and the Gulf War," last modified November 27, 2017, http://www.veterans.gc.ca/eng/remembrance/history/canadian-armed-forces/persian-gulf.

[97] CBC News, "A history of Canada's CF-18 Hornets."

Serbian forces, as part of a NATO mission in Bosnia-Herzegovina.[98] Nine years later, the RCAF had a major role in the combat mission in Afghanistan 2008-2011, providing reconstruction teams and combat forces to the International Security Assistance Force (ISAF). The RCAF contributed by providing CH146 Griffon and CH147 Chinook helicopters, as well as transport aircraft (CC-130 and C-17s) and Unmanned Air Vehicles (UAVs).

In the early 2000s, the RCAF provided security for the 2010 Winter Olympics in Vancouver, HA to Haiti and the Philippines, conducted air strikes as part of the NATO action against Gaddafi's regime in Libya, and participated in an advise and assist training mission in Iraq, countering ISIL.

This overview of the RCAF's operations evolution demonstrates how the roles of the RCAF have drastically changed since it first stood up in 1924. The RCAF is now responsible for providing the CAF with a wide spectrum of capabilities that are not solely combat focused, as they were in WWII. The recent defence policy summarizes this by describing today's operations:

> The RCAF generates space-based and aviation surveillance of Canadian territory and its approaches; maintains 24/7 aerial search and rescue response capabilities; and assists civil authorities in responding to a wide range of challenges and threats, from natural disasters to terrorist attacks.[99]

For the RCAF to meet its mission of providing the CAF with "relevant, responsive and effective airpower to meet the defence challenges of today and into the future," a plethora of capabilities and skills are required.[100]

---

[98] CBC News, "A history of Canada's CF-18 Hornets."
[99] DND, "Strong Secure, Engaged," 38.
[100] DND, "RCAF Overview."

Lack of Internal Integration in Recent Operations

Once the GoC indicates a desired military effect, it is the responsibility of the RCAF to ensure a clear understanding of the mandate, as well as any host nation sensitivities associated with an operation before assigning resources. Other factors to be considered include logistics, aircraft technical limitations, sustainability, security etc. Without these considerations and inputs, airpower output may not be as optimized or effective as it could be. Unfortunately, in many cases, planning groups within a HQ or Sqn are comprised of exclusively pilots, which means that a natural bias may be in effect. This would also likely be the case if the HQ were made up of all engineers for example. If all pertinent information and factors are not considered, decisions may not be in the best interests of the RCAF. Equally, capabilities may not be appropriately assigned to mission sets, resulting in an undesired outcome.

Unfortunately, in some instances, the RCAF has introduced risk by limiting itself to a singular focus of getting aircraft in the air, without considering all aspects of the operation and the required associated support. Here are a few examples that have been both anecdotally discussed throughout the Air Force and written about as lessons learned:

1. Counter Insurgency (COIN) in Afghanistan (Op Athena) in 2008 – When the CH146 Griffon aircraft first arrived in Kandahar, they were not able to sustain flying more than a couple of days, due to the fact that the required oil and hydraulic fluid did not arrive from Trenton.[101] However, pallets of office supplies and other non-critical items had arrived. The appropriate emphasis was not placed on ensuring sustainment supplies were shipped immediately to theatre. As a result, the detachment (det) was forced to borrow oil and hydraulic fluid from other nations for the following four weeks with a guarantee that the supplies would be replenished once the Canadian stock arrived. It is not certain where the errors took place in the chain, but this example demonstrates that sometimes in the RCAF, the emphasis is singularly focused on getting aircraft in the air and not on the required support;

[101] Based on the author's first hand account, as a CH146 Griffon maintenance officer deployed on the operation

2. HA in Haiti (Op Hestia) in 2010 – Based on lessons learned promulgated from the Canadian Forces Aerospace Warfare Centre (CFAWC), "movement priorities were prudently applied to airlifted forces but less so for deployment and sustainment of the air mission."[102] The impact of not developing a thorough aircraft movement plan to ensure aid supplies and aircraft support for the mission meant that there were delays in the support provided to the Haitian people. This also created "inefficiencies in the overall movement effort."[103] The root of the issue was mainly at the operational level HQ; however this example simply illustrates the point that personnel in key leadership and operational roles need to be able to understand and represent all aspects of the operation to ensure the appropriate delivery of airpower;[104] and

3. HA in the Philippines (Op Renaissance) in 2013 – CH146 Griffons were deployed to the Philippines to assist the population following a typhoon.[105] When the det arrived, it came to light that a robust plan to receive spare helicopter parts was not set up to enable fast transactions in location.[106] The contract was not flexible enough to adapt to this type of situation and parts would take three weeks to travel from Calgary, AB. The recommendation from the det was to access the Bell Helicopter parts depot in Manila (a two-hour drive); however this was not possible with the current parts contract. As a result, parts had to be robbed back and forth aircraft, incurring delays until the ordered parts arrived from Calgary, meaning the support to the Philippines was also impacted. Potentially, when the Bell contract was initially developed or when the det was preparing, the appropriate amount of emphasis was not placed on maintenance and logistics required to support operations.[107]

These examples speak to the weakness of the RCAF planning process. Although it cannot be confirmed which occupations were present for the planning that took place, it is evident that support input was not emphasized to the level that was required. As a result, operations were poorly planned, and the mission was negatively impacted. It is the

---

[102] Department of National Defence, "Airlift Command and Control – Operation Hestia," *Canadian Forces Aerospace Warfare Centre, Lesson Analysis Project – Findings Report* (2010): ii.

[103] DND, "Operations Hestia," A-2

[104] *Ibid.*

[105] CTV News, "Canada sending 3 military choppers to assist in Philippines relief effort," last modified November 16, 2013, https://www.ctvnews.ca/canada/canada-sending-3-military-choppers-to-assist-in-philippines-relief-effort-1.1546283.

[106] This example was provided by an unnamed pilot Capt who worked in the operations cell as part of the det deployed to the Philippines.

[107] *Ibid.*

responsibility of leaders within HQs and 1 Canadian Air Division to ensure all aspects of the operations are integrated.

Conceptual Foundations indicates that "internal integration," which refers to monitoring, inspecting, correcting and evaluating is required for organizations to be effective.[108] It would have been very difficult for these steps to be effectively completed in the examples above, without inputs from all aspects of the operation.

Future Operations

Internal integration is currently a weakness of the RCAF that will become further compounded in future operations without change. Canada's Defence Policy, *Strong, Secure, Engaged (SSE),* acknowledges that the future security environment is "extraordinarily complex" and requires a "fundamentally new, agile, modern and responsible approach to defence."[109] The defence minister noted that as the world is rapidly changing and becoming less predictable: "the distinction between domestic and international threats is becoming less relevant. Therefore, we cannot be strong at home unless we are also engaged in the world."[110] Consequently, a wide spectrum of outputs from the RCAF will continue to be needed globally.

The Canadian Forces Aerospace Warfare Centre (CFAWC) recently (2016) produced the Future Air Operating Concept (FAOC), which provides an outline of the air power capabilities that are/will be required in the future to respond to current and emerging threats. In fact, CAF doctrine highlights the need for "external adaptability," in other words the ability for organizations to anticipate (and prepare for) the future.

---

[108] DND, Con*ceptual Foundations,* 20.
[109] DND, "Strong Secure, Engaged," 63.
[110] *Ibid.,"* 6.

The current security environment requires the RCAF to participate in domestic, continental and expeditionary operations, which entail 11 functional areas. These functional areas include a wide range of effects, such as support to military operations other than war (MOOTW) and high intensity Anti-access/Anti/denial operations:

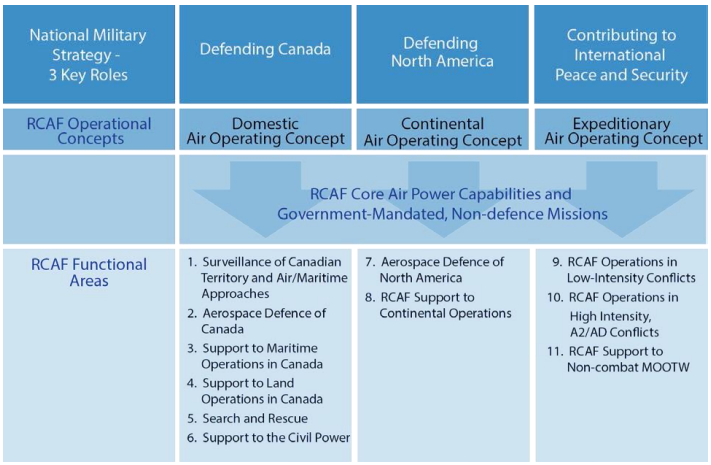

Figure 1: Future RCAF Functional Areas from the Future Air Operating Concept[111]

It is important to note that the common requirements between these functional areas include: integrating and sharing information within the RCAF and with joint partners (Army, Navy, US Air Force), rapid and coordinated decision making, and maximizing effects and capabilities provided to the CAF. The CFAWC identified these requirements as critical to the success of the RCAF in future operations. However, integration in operations has been a weakness for the RCAF.

A Flexible, Integrated, and Balanced Approach to Future Operations

The FAOC indicates that the future security environment will include a broad range of threats, and will vary from "unconventional militant groups with limited technological capability to adversarial states possessing advanced military capabilities."[112] The challenge in this scenario is that the RCAF is quite small, so to be able to effectively

[111] DND, *Future Air Operating Concept,*14; A more detailed breakdown can be found at Annex C.
[112] *Ibid.,3.*

respond to each potential threat, the RCAF has to be flexible, integrated, and balanced.[113] This means that the RCAF needs to be able to prepare its organization with a wide range of skills, so that teams can then be task-tailored.

Fittingly, the FAOC indicates, "the trend of the RCAF employing air task forces (ATFs) with capabilities appropriate to the specific operation will continue."[114] Therefore, now more than ever, it is critical to select individuals for positions (at home and deployed) based on their skills/qualifications and personal/leadership attributes, rather than simply occupation. The commander of Canadian Special Operations Forces recently stated "you can't fall in love with your structure or become emotionally attached. An effective team may mean one that is built by taking small groups from different units to form the package."[115]In some cases, for example, an RCAF mission may require personnel to have experience in air-to-ground combat, while other missions may require strong negotiating skills for a complex mission involving government and municipal counterparts.

In terms of integration, the previous RCAF Commander, LGen Hood, emphasized the importance of joint (Army, Navy, and Air Force) operations to better employ Canadian airpower, rather than individual capabilities.[116] A similar point can made for integrating personnel and capabilities within its own organization. Rather than relying on pilot-only input in operations, other occupations and skills can be brought into the mix to provide a more well-rounded and informed approach to a problem.

---

[113] DND, *Future Air Operating Concept,*1.
[114] *Ibid.*, 4.
[115] MGen M. R. Rouleau, Comd CANSOFCOM, briefing to Joint Command and Staff College, Canadian Forces College, 19 Apr 2018.
[116] DND, *Canadian Forces Air Doctrine*, ii.

Maintaining and attempting to substantiate a legacy structure that has not been validated or re-assessed since its development will become increasingly difficult to sustain. Already, the FAOC and the SSE call for future approaches that are "comprehensive, integrated, adaptive, and networked," which contradict the RCAF's current model.[117] The FAOC further explains "these attributes must become the tenets that govern the nature of the future force and the requirements for being strategically relevant, operationally responsive, and tactically decisive."[118] For the RCAF to be successful in this endeavor, it must not limit its key operations and leadership roles to pilots, but open its positions to the best person for the job.

Balance of Capabilities: Quality over Quantity

CAF doctrine says, "a balanced air force is critical to national security."[119] To measure this balance, the emphasis should be placed on quality of outputs rather than the quantity of platforms. As per the FAOC, what's important is "the effect created through the synergistic and synchronous application of the right quantity and type of capabilities to explore the inherent flexibility and impact of air power across its core capabilities."[120] In other words, the Air Force has to ensure it has the right capabilities that can be tailored to provide a specific airpower effect.[121] It's about quality over quantity.

The 'quality versus quantity' discussion can be further illustrated by Liddell Hart's explanation in *Revolution in Warfare* written during WWII, when he stated "quantity counts for little unless it implies quantity of quality." For example:

---

[117] DND, *Future Air Operating Concept, 3.*
[118] *Ibid., 3.*
[119] *Ibid*., 5.
[120] *Ibid*., 4.
[121] To note, the core air power capabilities include: Control of the air, Attack, Surveillance and Reconnaissance (S&R), Air mobility, and Support to joint operations and the civil power (DND, *Future Air Operating Concept,* 5).

> In 1940 the value of the French bombing force was reduced almost to zero because most of its aircraft were too slow to have any chance of getting through the German fighter screen, and were thus powerless to interfere with the invading armies. A few months later, the Germans' prospect of invading England was frustrated because the great numerical superiority of their air force was cancelled out by the technical superiority, in speed and dire-power, of the British eight-gun fighters of the Spitfire and Hurricane types.[122]

It's not about number of aircraft, but what effect they can provide. Equally, for people, it's not about meeting status quo numbers of set occupations, but about the people and the specific skills they bring to the table.

In a deployed scenario, generally a higher stress environment, personnel attributes, skills, and experience become even more important. Therefore, if an individual is in a deployed position based on their occupation rather than merit, the RCAF is potentially limiting the quality of its decision making, and therefore its effects and capabilities. This is significant for government-mandated mission that has risks associated with its outputs. As per the effectiveness dimensions for external adaptability, leaders are most effective when they are able to integrate the right information and people, and draw on the expertise within their team to react to unpredictable scenarios.[123]

For the RCAF to provide relevant, responsive, and effective airpower it always has to be focused on the quality of its outputs. The FAOC validates this approach with its direction and guidance on expeditionary operations: "air power will continue to be a critical component to each operation across this spectrum, but its exact role and utility is situational and dependent upon having the right capabilities employed in the right way at the right time."[124] For a small air force to succeed in modern warfare, airpower outputs

---

[122] Liddell Hart, *Revolution in Warfare*, 21.
[123] DND, Con*ceptual Foundations*, 21.
[124] DND, *Future Air Operating Concept*, 10.

will have to be built upon the best ideas and capabilities (equipment and people) available, and must not be limited to traditional models or ways of thinking. As Charles Darwin once stated, "it is not the strongest species that survive, nor the most intelligent, but the ones most responsive to change."[125]

Furthermore, the CAF has indicated through the CFAWC that the "the RCAF of the future must recruit, train and retain the right people with the right skills; establish agile processes; and be organized in such a manner that it can easily adapt to, and sustain its efforts in meeting future challenges."[126] This further endorses the requirement to open up its positions to all air force occupations if the RCAF is serious about providing a balanced and tailored approach to airpower.

Remotely Piloted Systems

According to Canada's recent defence policy, the CAF will "acquire next generation surveillance aircraft, remotely piloted systems – commonly referred to as "drones" – and space-based surveillance assets to significantly expand its joint intelligence, surveillance, and reconnaissance capacity."[127] The policy also indicates that the CAF will invest in "a range of remotely piloted systems, including an armed aerial system capable of conducting surveillance and precision strikes."[128] These platforms will be integrated with operations centres so that real-time information can be collected and analyzed to enable decision-making.[129]

---

[125] John S. McCallum, "Adapt or Die," *Ivey Business Journal*, last modified December 2001, https://iveybusinessjournal.com/publication/adapt-or-die/.
[126] DND, *Future Air Operating Concept, 23*.
[127] DND, "Strong Secure, Engaged," 15.
[128] *Ibid*., 111.
[129] *Ibid*., 111.

The need for remotely piloted systems, and its likely proliferation in Canada and amongst allies and adversaries, will significantly change how air forces currently operate. For example, some Unmanned Air Vehicles (UAVs) and drones are physically smaller and can operate in spaces that piloted aircraft traditionally couldn't, such as built-up areas (where detection is likely) and highly volatile areas (high risk to personnel). The CAF acknowledges that remotely piloted systems are "important tools that help remove humans from dangerous situations, and permit operations in severe and inhospitable environments."[130] Equally, this means that adversaries will be using similar technology as it becomes available, and Canada and its allies will have to counter this threat.

Remotely piloted aircraft will remove risk to human life, because the individual operating the system will be physically located in a safe zone. The risk in operations shifts from placing human lives in danger, to losing an expensive piece of equipment. This is a game changer for air warfare. Without a person in the cockpit, fewer limitations are also imposed on the aircraft/vehicle. For example, Lockheed Martin recently demonstrated an F-16 unmanned combat air vehicle that executed a ground strike mission on its own.[131] Removing the concern associated with G-force effects on the human body may also enable a more robust aircraft design that can operate in demanding conditions.

As SSE indicates, remotely operated systems are required for the RCAF to stay relevant amongst its allies and responsive against its adversaries. This capability will help Canada provide effective airpower to meet the needs of the country in future security environments. This then begs the questions: how will the RCAF organizational structure look in the future? Will a pilot-dominant model still be in effect? Will units still be

---

[130] DND, "Strong Secure, Engaged," 73.

[131] Alex Lockie, "The Air Force Just Demonstrated a Fully Unmanned F-16 Fighter Jet," *Business Insider,* last modified April 12, 2017, https://taskandpurpose.com/unmanned-f-16-fighter-drone/.

separated by platform, or will piloted and non-piloted vehicles be combined under the same roof? These questions are not easily answered but a few things are for certain with the investment of remotely piloted systems: less emphasis will be place on piloted aircraft, who (which occupation) will operate the remote systems is up for debate, and the arguments associated with having pilots in most key operations and leadership roles will become more difficult to validate.

The physical and cognitive abilities associated with flying in an aircraft may no longer be as sought after for those filling key operations and leadership roles. The current defence policy, SSE, specifies that the CAF must "attract Canadians with the aptitudes and skill sets required to succeed in highly technical domains such as space and cyberspace and to operate and maintain increasingly sophisticated equipment, including remotely piloted systems."[132] This base of knowledge calls for technical expertise that may come from signals occupations or other technical trades for example. This reinforces the need for a flexible and adaptable organization that is integrated that by joint and combined information. Organizations supporting piloted or remotely piloted aircraft need to be set up to respond in the most effective way possible.

CHAPTER 5: EFFECTIVE AIRPOWER AND OPTIMIZING OUTPUTS

The *History* and *Leading from the Front* chapters provided an overview of the current RCAF organizational structure, while the *Current and Future Operations* chapter provided an outline of the tasks the RCAF must be able to support. The analysis revealed that the RCAF may not be operating at its maximum operational potential, and there is

[132] DND, "Strong Secure, Engaged," 20.

gap between the capability of the RCAF's current model and the output that it will be required to support future operations.

As part of the research for this DRP, the author was able to observe operations at Air Canada through the months of April and May 2018. This access allowed the author gain an appreciation of Air Canada's organizational structure and some of its key processes that enable the company to be efficient and effective. Much like the RCAF, to be successful the passenger airline must provide an aviation service that is relevant, responsive, and effective.

The following chapter will highlight: characteristics of effective ops centres, the current RCAF ops centre construct, and specific Air Canada examples that could be applied to help the RCAF reach its maximum operational effectiveness. The key Air Canada lessons to take away are: all occupations need to be represented in ops centres, goals need to be set and measured, and the risk of bias in decision-making must be mitigated through encouraging inputs from all perspectives.

Effective Leaders = Effective Airpower

An ops centre is the key node within an operational unit or HQ whose leaders tailor, coordinate, and allocate resources to provide a specific effect, in line with the commander's intent or government direction. To get the best outcomes, it is critical that this centre is functioning as best as possible. As highlighted by *Conceptual Foundations*, effective leaders are expected to plan and execute tasks, allocate and manage task resources, exemplify professional competence and commitment, train hard to improve

individual and team performance, supervise individual and group performance, and set and clarify goals.[133] This includes leaders within ops centres.

In order to fulfill these requirements, RCAF ops centres (mostly occupied by pilots) must align aircraft with flying tasks while considering factors such as aircraft unserviceabilities, movement of aircraft parts, fuel and equipment (logistics), intelligence reports (environment specific), aircraft configurations, specific equipment installed, weight and balance, weather, air traffic control, and the overall safety of aircraft and personnel. This is a considerable amount of information to gather and then manage from other members working in different locations throughout the organization. However, this is unfortunately the case. Since RCAF ops centres are typically one-occupation deep, it is unrealistic for the team to manage all of these (sometimes unfamiliar) facets and optimize the outputs. This model does not set the ops officer up to successfully plan/execute tasks, and/or allocate/manage resources.

Additionally at the unit level, since most ops personnel are pilots, they also have to maintain operational flying skills. This can make it very challenging to simultaneously be committed to leading and improving the performance of the ops centre. This situation can lead to task saturation, as ops staff attempt to balance all of these requirements. Furthermore, in a high-tempo environment, an situation of dual-tasked pilots running ops (i.e. general duties officers) could lead to miscommunication, ineffective outputs, lost training opportunities, conflicting priorities, and unnecessarily strain on personnel.

Lastly, effective leaders are expected to set and clarify goals and supervise performance. This is one of the most critical components of effective airpower and optimizing outputs, therefore it will be expanded upon in the next section.

---

[133] DND, Con*ceptual Foundations*, 50.

Setting and Measuring the Right Goals: RCAF vs Air Canada

Effective airpower requires setting and measuring the right goals. When operations centres consist of one occupation, and other sections/occupations are not represented, developing unit goals that are realistic and attainable will naturally have its challenges. In some cases at the unit level, targets are not always clearly set and therefore unknown to others within a Squadron. This may be a result of an overtasked situation (multiple focuses) and/or simply not having the expertise in the ops section.

The author's experience as a maintenance officer at two different squadrons revealed that unit targets focused mainly on achieving high serviceability rates and high yearly flying rates (YFR) as measures of performance.[134] It is evident that getting aircraft serviceable was the main purpose of the maintenance flight, but it is somewhat flawed to measure unit performance as number of serviceable aircraft. Long periods with serviceable aircraft does not necessarily mean that the aircraft are flying, nor does it always mean that maintenance is carried out to a high standard. In some cases, high serviceability rates can be accompanied with mistakes or flight safety issues. Furthermore, if aircraft have high rates of serviceability and high rates of flying, this also does not mean that the flying hours or yearly flying rate (YFR) have been used effectively. Therefore, it is important to determine what success looks like for a Squadron and how flying hours should be used, so that meaningful observation points can be developed.

[134] Based on author's experience as a maintenance officer at 408 Tactical Helicopter Squadron, Canadian Helicopter Force (Afghanistan), and 427 Special Operations Aviation Squadron over a five year period between 2007-2017.

Through recent discussion with a former Ops O (pilot) of a 1 Wg flying unit, it was learned that clear and measurable targets were not set for his former unit.[135] YFR was the usual 'agreed-upon' performance measurement, even though high rates of flying did not measure quality of flying or mission-ready status. Also, there is not necessarily a direct correlation between YFR and number of pilots upgraded to Aircraft Captain, or level/quality of training accomplished on items such as rappel or dust ball training. YFR also does not provide an indication of the number of pilots who have meet their yearly minimums (i.e. sequences).[136]

Separately, there was evidence provided from the Ops O of another unit that uses the number of flights carried out per week as its main operations metric; measuring quantity rather than quality.[137] The metric compared the number of flights that were scheduled by the unit ops centre with the number of flights that were cancelled for reasons pertaining to weather, aircraft, crewing and/or ops. However, this information is not overly useful because the schedule had not been developed based on any specific pre-set goals, and the schedule may not have been realistic to begin with. Since other sections within the unit (i.e. aircrew scheduling, maintenance crew support or logistics) do not review the schedule for feasibility, it may not have been supportable from the onset. For example, the schedule may have planned for more flights than there were aircrew or aircraft available. This metric would likely be more useful if targets for the week were pre-set based on CO priorities, and if all supporting sections within the unit had verified its supportability through an ops centre.

---

[135] Info provided through discussion with an unnamed 1 Wg LCol, a former Ops O at a 1 Wg flying unit.
[136] *Ibid.*
[137] Info provided from an current Ops O at a flying unit.

On the maintenance front, during a visit to 1 Wg HQ, the maintenance section indicated that the amount of time an aircraft in the CH146 fleet spends in heavy maintenance is tracked, but specific reasons for delays are not necessarily known.[138] Therefore, without this information it is nearly impossible for maintenance 'turn around time' to improve. It was indicated by the HQ that reasons for delays are not clearly indicated is because there is no standardized tracking/measuring program that units are mandated to use. This would need to be directed from the 1 Wing Comd (pilot) to mandate standardized tracking to his COs (pilots) of units.

Visits to Air Canada revealed a much different approach to goal setting. The company was significantly focused on developing objectives to help meet its goal of becoming "one of the world's best global airlines."[139] It is understood by the author that the scope of the RCAF is quite different than Air Canada, a revenue-driven company. However, the goal of providing an aviation service that is safe and effective is the same.

The Systems Operations Control (SOC) in Toronto had clear laid-out targets and live tracking was broadcasted daily on television monitors within the SOC and in hallways throughout the building. This automatically set the tone of an output-driven organization. The targets were based on various aspects of their service that touch every aspect of its operation, from passenger movements, routing management, maintenance, logistics, and load planning. Employees knew know how their piece of the puzzle could impact the company's targets. Air Canada was able to do this by clearly outlining its goal and how it would achieve this, through meetings and training provided to its 30,000

[138] Based on author's discussion with A4 Maint Ops team at 1 Wg HQ on 29 May 2018.
[139] Air Canada, "2017 Annual Information Form," 5.

employees.[140] This goal was broken down into smaller attainable targets that are being measured on a daily basis.

Some of the key performance indicators (KPIs) for Air Canada included departure on time performance, arrival on time performance, and number of MELs (minimum equipment list or unserviceable items on the aircraft). This information was measured on a 24/7 basis and targets were consistently compared against the actual performance. Each morning the performance was discussed together by managers across the country to determine what actions needed to take place to improve. It was evident through visits to the SOC, the maintenance hangar in Toronto, and the Air Canada Headquarters in Montreal that Air Canada is a company focused on assessing and improving performance.

As for maintenance practices, Air Canada emphasized its desire for continuous improvement through its "Maintenance Excellence 5.0" initiative. The purpose of the initiative is to improve its overall maintenance service to help reach Air Canada's goal of becoming one of the world's best global airlines.[141] To do this, the company is concentrated on delivering the highest industry standards as possible through its focus on people, process, and technology.[142]

Following a review of Air Canada's ops centre model, it became even more clear that the RCAF will not be able to reach its maximum operational effectiveness if goals and targets are not pre-set and clear at all levels. Much like Air Canada, clear targets need to start with the key leadership (unit CO and higher) and filter down to ops centres. It is

[140] 30,000 number provided by the General Manager of the SOC in May 2018.
[141] Air Canada, "Maintenance Excellence 5.0, People, Process, Technology," (2018).
[142] *Ibid.*

difficult to understand how flight commanders can improve performance if they do not know what the overall unit targets are, even more so if they do not have a representative in the ops centre. General Stanley McChrystal talks to this point in reference to his former ops team within the Joint Special Operations Command. He explains that his team: "nurtured holistic awareness and tried to give everyone a stake in the fight. When we stopped holding them back—when we gave them the order simply to place their ship alongside that of the enemy—they thrived."[143] In other words, when all members felt part of the mission and the targets, their performance was better. Similarly, all members within a unit need to be focused towards the same goals in order to function and thrive together. Otherwise, the probability of units providing relevant, responsive, and effective airpower is low.

Plan, Execute, Measure, Adjust (PEMA)

On occasion, military members are heard stating that efficiency is not a priority for the CAF because it is not a revenue-making organization. However as indicated by the CFAWC, "the future RCAF must maintain the ability to perform all of the pertinent defence missions across each of CAF's fundamental roles and determine the most effective and efficient manner to perform the government-mandated, non-defence missions."[144] Furthermore, SSE states that the Department of National Defence will be moving towards a modern "business of defence that maximizes operational output and ensures that every defence dollar is put to the best use in achieving our objectives. The Defence team is committed to continuous improvement."[145] When processes are efficient (functioning in the best possible manner with the least waste of time and effort) airpower

[143] McChrystal, Fussell, Collins, and Silverman, *Team of Teams.*
[144] DND, *Future Air Operating Concept,* 6.
[145] DND, "Strong Secure, Engaged," 74.

outputs will also be more effective (producing the expected result).[146] And as stated by a senior aircraft technician within 1 Wg HQ, because personnel and qualifications are so limited in the RCAF today, efficiency is the only way to make it work.[147]

In the case of Op Hestia for example, if a thorough plan had been developed for aircraft movements and aid supplies, there may have been fewer delays in providing support to the Haitian people.[148]

In a recent presentation by Vice-Admiral Ron Lloyd, the Commander of the Royal Canadian Navy, he highlighted the importance for units to plan, execute, measure, and adjust (PEMA).[149] He believes that the CAF needs to run aspects of its organization more like a business. This is also in line with the SSE, which states that the CAF should be "leveraging best management practices from the private sector" and "striving to continually improve efficiency and effectiveness…to modernize the business of defence."[150] The commander stated "the CAF is good at planning, great in execution, but does an exceptionally poor job of measuring and adjusting in order to ensure we learn from our mistakes."[151] Following this logic, without a shift to measuring and adjusting performance, the RCAF could slide into future operations with less than ideal processes, leading to an air force that produces sub-optimal results.

The fact that the RCAF is still organized based on a structure that was formed over seventy years ago, when missions were significantly different, reveals that the RCAF is

---

[146] Gareth Goh, "The Difference Between Effectiveness and Efficiency Explained*," Insight Squared*, last modified August 9, 2013, http://www.insightsquared.com/2013/08/effectiveness-vs-efficiency-whats-the-difference/.

[147] Warrant Officer in A4 Maint Ops section at 1 Wg HQ during 1 Wg visit on 29 May 2018.

[148] DND, "Operations Hestia."

[149] VAdm R. Lloyd, Comd RCN, *briefing to the Joint Command and Staff College, Canadian Forces College*, 17 May 2018.

[150] DND, "Strong Secure, Engaged," 74.

[151] VAdm R. Lloyd, Comd RCN, *briefing to the Joint Command and Staff College, Canadian Forces College*, 17 May 2018.

also due to measure and adjust. Questions that should be answered are: is the RCAF setup to be as relevant, responsive, and effective as it can be? How could it be improved? Potentially, the RCAF has been so culturally attached to its pilot-dominated culture and traditions that it neglected to self-assess. Regardless of the reasons, it is certain that measuring and adjusting the RCAF's current organizational structure and its operations centre processes is necessary for success in future operations.

Integration and Perspective

The *Current and Future Operations* chapter provided insight into the importance of an integrated and networked force. Additionally, the FAOC indicates that the vision for the CAF C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance) is "to provide the right knowledge to the right people at the right time in a secure, reliable and integrated manner in support of CAF operations."[152] If the same methodology were to be applied to ops centres in the RCAF, personnel of all occupations/experiences would be integrated together so that the right information would be available at the right time, and brought to bear when necessary.

At the Air Canada SOC, many people work side-by-side looking at the same problem, but from different perspectives. For example, a flight may be cancelled due to weather and has to be rescheduled. Within a few feet of one another, representatives from routing, passenger movements, and maintenance will look at possible options together for rebooking but through different lenses.[153] The routing manager may look at other possible flights to get passengers around bad weather and quickly to their destination, while passenger movements may have to consider the well-being of the passengers based

[152] DND, *Future Air Operating Concept*, 6.
[153] Based on observation at SOC in April 2018.

on their travel time and distribute hotel or meal vouchers as required. The maintenance representative will provide viable aircraft options that have taken upcoming maintenance inspections into account. The plans and the responses matter, as it is an output-driven company. The general manager of maintenance excellence pointed out that "having more than one point of view to solve a problem enables the organization to be responsive and adaptable."[154] From the engineering section, the cabin interior manager also noted, "coming to the table with another background makes you whole and tapping into previous knowledge and experience can be worthwhile for the organization."[155] For the RCAF, when ops centres are run by pilots-only, other aspects of the operation can be precluded. Likewise, if solely engineers controlled ops centres, the perspectives would also equally limited.

When ops centers are integrated with all aspects of the operation such as logistics and maintenance, reports and returns would also encompass all aspects of the operation. At a flying unit, sitreps are produced and send to higher command. As highlighted by Air Canada's business analytics team, the purpose of collecting information and statistics is to enable managers and executives to make decisions.[156] If certain areas of the operations are not represented, the right items are not necessarily being tracked and managed.

In the RCAF, a lack of integration and understanding has potentially led to negative operational impacts. For example, at most RCAF Squadrons, a push and pull relationship naturally exists between operations centres and maintenance flights, based on the nature of their core responsibilities. The main problem that often arises from this setup is that aircrew proficiency requirements are not well understood by maintenance personnel and

[154] Boyd Parsons, General Manager of Air Canada Maintenance Excellence.
[155] Based on conversation with manager of Cabin Interiors, Engineering.
[156] Based on conversations with business analytics team at Air Canada, April 2018.

aircraft inspection/airworthiness requirements are not well understood by operations personnel (or pilots in key leadership roles). Therefore, there are many times when aircraft availability and pilot availability will not be synchronized. As a result, aircrew training requirements are not met, which can impact deployment readiness. Equally, when ops centre is focused simply achieving the highest YFR as possible, maintenance personnel can become unnecessarily burned out. If ops centres are occupation diverse and appropriately represent all aspects of the operation, such as crew scheduling and maintenance, these issues could be easily prevented. A plan that has been developed by all players would help increase the chances of success. Along the same vein, Air Canada's maintenance excellence initiative aims to ensure employees have a cross functional understanding of other positions at Air Canada.[157]

Bias and Conflicting Priorities

As mentioned, in RCAF ops centres, most positions are made up of pilots who split their time between working in ops and flying as line pilots.[158] There are two main downfalls with this model that lead to bias and conflicting priorities.

Firstly, being one trade, the group does not represent all aspects of the operation, which could lead to the group making decisions that are not necessarily best for the organization. As explained by Frith and Bang, "when group members hold similar prior beliefs, their inferences will be biased in similar ways. For example, members of the same political party are likely to interpret incoming data in the same way regardless of

[157] Air Canada Maintenance Excellence 5.0.

[158] This is generally known throughout the RCAF. At one CH146 flying unit for example, 7/7 ops members are pilots. 4 are proficient/current and 3 individuals have temporary medical status.

whether they discuss their interpretation with each other."[159] It is generally known that biases can distort decision-making and can lead to undesirable outcomes.[160] Decisions should also be in-line with the intent of the CO (or higher) but even in that case, most of the key leadership positions in the RCAF are also made up of one occupation (pilots). Similarly, if logistics personnel managed an ops centre, decisions would also tend to unconsciously favour logistics.

Secondly, when individuals are given two focuses (work in an ops centre making decisions that best represent the unit's priorities and maintain a high standing of flying skill), these may be conflicting. For example, in a situation with limited resources (i.e. aircraft or short weather window) it is the responsibility of the pilots in ops to ensure that the resources are allocated to the cause that is best for the organization, even if that means cancelling his or her own proficiency flight. But this may not always be easily done. This situation is naturally conducive to a self-serving (but potentially unconscious) bias. The University of Texas defines self-serving bias as "the tendency people have to seek out information and use it in ways that advance their self-interest" and often it "blinds us to the ways in which we are prejudice in favor ourselves."[161] However, Frith and Band state that "identity diversity (when groups have individuals with different backgrounds and culture) stimulates individual thought; people who are not like us make us reconsider our own position."[162] The authors also highlight that "while our own biases

---

[159] Dan Bang and Chris D. Frith, "Making Better Decisions in Groups," *US National Library of Medicine National Institutes of Health*, last modified August 16, 2017, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5579088/.

[160] Raphael Grzebieta, "Influence of Cognitive Biases in Distorting Decision Making and Leading to Critical Unfavorable Incidents," *MDPI Safety*, last modified November 3, 2015, http://www.mdpi.com/2313-576X/1/1/44/htm.

[161] McCombs School of Business, "Self-Serving Bias," *Ethics Unwrapped*, last viewed June 15, 2018, https://ethicsunwrapped.utexas.edu/glossary/self-serving-bias.

[162] Bang and Frith, "Making Better Decisions in Groups."

are often hidden from ourselves, we are remarkably good at detecting others' biases."[163] In an ops centre that houses different occupation backgrounds and experience, the probability of self-serving behaviors coming to fruition is lower.

This information then begs the question of bias in data collection. If an ops centre that is supposed to be efficient and effective is not performing, but is responsible for collecting performance statistics for the unit, the results may be biased. For example, a metric was mentioned previously that included number of flights scheduled versus number of flights cancelled. A unit ops centre provided the information for 2017. The reasons for cancellations were broken down with the following averages: 41% weather, 37% (aircraft), 10% (ops), 7% other, and 5% (aircrew).[164] However, the maintenance officer for the same unit provided an average rate of 75% serviceability status for the year, based on official electronic maintenance records. These numbers mean that on an average day, 75% of the unit's aircraft are serviceable but ops reported that 37% of the scheduled flights were cancelled. This indicates that the ops centre is either over planning its aircraft assets (i.e. planning for more flights than aircraft available) or there is bias in the reporting when a cause has to be attributed to the cancellation. Potentially the reason is a bit of both. In the end, these types of statistics reflect poorly on an organization, as there appears to be poor planning or the presence of conflict between sections.

In the case of the push and pull between maintenance and ops centres, aircraft planning is typically a contentious issue. Maintenance personnel are keen to stagger aircraft maintenance to a schedule that suits them, and ops personnel are typically keen to plan to fly as many aircraft as possible. Also, some ops centres have a history of not

[163] Bang and Frith, "Making Better Decisions in Groups."
[164] Information provided by an Ops O from a flying unit.

prioritizing maintenance test pilot/ground run duties, ground training, or planned aircraft downtime. The answer here is to build an ops team that is neutral and unbiased, and represents all occupations within the organization. This will benefit the unit as a whole, as all unit requirements would be better understood. Once bias is limited, the ops centre will be able to develop valuable metrics and KPIs, and ensure that all sections are focused on the same goal and aligned with the same targets. If the goal is to fly more hours, inputs from other sections can provide options on how to achieve this.

CHAPTER 6: LEADERSHIP AND TECHNICAL ABILITY

Effective Leaders

The term "key leadership positions" was used in this paper to describe the leadership that is exercised downward by command, management, and ops positions overseeing flying operations. There are many overlapping philosophies between leadership, command, and management that look different depending on the author. The important thing to note is that in the CAF, it is expected that all officers demonstrate effective leadership, whether this is leading a crew in a cockpit, or managing resources within an organization.

The responsibilities of CAF leaders that enable them to be effective include: internal integration, external adaptability, mission success, member well being and commitment, and military ethos.[165] The *Future Operations* chapter discussed the RCAF's lack of internal integration and external adaptability within leading the people dimension. And the *Effective Airpower* chapter covered the importance of mission success and measuring performance, and internal integration. Effective leaders must also take responsibility for members' well-being and harness their commitment, through mentoring

[165] DND, Con*ceptual Foundations*, Table 4-1, 48.49.

and developing subordinates, monitoring morale, and recognizing and rewarding success.[166] As for military ethos, effective leaders must continually "seek and accept responsibility, exemplify and reinforce the military ethos, maintain good order and discipline, and establish a climate of respect for individual rights and diversity."[167] This chapter highlights the disparity that exists when the RCAF relies solely on pilots to take on key leadership positions; positions that require subordinate mentorship and the enforcement of military ethos.

For a pilot to receive his or her wings it is an incredible feat that requires talent and focus. Becoming a winged pilot takes years and a minimum of 200 hours of flying, on average.[168] After pilots receive their wings, they still have to get specialty training on the aircraft they have been selected to fly (i.e. helicopters, transport, or jets). Once pilots are qualified on their specific fleet type, they then have to remain current and ideally proficient. This investment is varied by fleet type, but as an example, CH146 Griffon pilots require a minimum of 50 hours semi-annually plus specific sequences and targeted skills (i.e. instrument flying and emergency procedures) to be proficient.[169] The time necessary today for pilots to become trained and proficient is a far cry form the 6.7 hours that was required in WWI.[170] However, although significant time is allotted to train pilots, the current model does not include adequate leadership training (outside of the cockpit) to enable pilots to succeed in future leadership roles beyond the Captain rank.

Pilots receive basic leadership training with all other officers during the Basic Officer Training Program, a military introduction course received upon joining.

---

[166] DND, Con*ceptual Foundations*, Table 4-1, 48.49.
[167] *Ibid.*, 51.
[168] Info provided from an instructor pilot at a RCAF Flying Training School, May 2018.
[169] Confimed by 1 Wing tactical flying standards officer.
[170] Wise, First World War, 40 and 85.

However, after this course, pilots are then focused on flying training while other officers receive leadership training on top of their occupation training. Once posted to a unit, "aircrew rarely get the chance to lead until they reach the rank of major and became flight commanders," unlike ground-crew officers in the Air Force, Army, and Navy elements who "often lead small sections as part of their first job."[171] For pilots, leadership exposure is generally "gained with peers and fellow officers and not with airmen or airwomen."[172] This means that by the time pilots start to lead airmen and airwomen at the rank of Major, other occupations with the same amount of time in the RCAF will have had at least six more years of leadership experience.[173] This makes it significantly more challenging for pilots to gain the leadership experience required to successfully command a Squadron a few years later.

Furthermore, the current pilot career path is set up in a way that "aircrew do not receive mentoring from senior NCOs [Non-Commissioned Officers] in their first command appointments in the same way that ground-crew officers do."[174] Many ground-crew officers would likely say that the senior NCO-junior officer mentorship period at the Lieutenant (and sometimes Captain rank) was critical for their leadership understanding and development. This phase teaches junior officers about how to look after and develop subordinates, as well as how to reinforce the military ethos and maintain good order and discipline. However, this phase is also missing in the current pilot career path.

Since the leadership development of pilots is much different than those of ground

---

[171] English, "The Masks of Command," 17.
[172] *Ibid.,* 17.
[173] Based on one year of trade training, two years as a Lt, and four years as a Capt.
[174] English, "The Masks of Command," 17.

crew officers, this will naturally lead to some conflict and differences of opinion between the two groups with respect to how they believe organizations should be managed. By the time a pilot becomes a CO, he or she is expected to be able to effectively plan, direct, and allocate resources, all driven by realistic goals and targets for the organization.[175] But in some cases, they may not have had the right training and/or experience to do so. As Allan English points out, this disconnect may also come to the surface during joint operations, since other officers (i.e. army officers) have received senior NCO mentorship early in their career.[176] This is not to say that pilots cannot effectively lead, because that is simply not the case. Rather, this analysis points out that the current pilot training and career path model is not enough on its own to develop effective leaders. Successful unit command within the RCAF requires more than just technical acumen and an ad-hoc approach to leadership development.

The RCAF has had some phenomenal pilot leaders, and innovators. However these abilities did not simply come from their flying training and pilot career path. Natural leadership ability, judgement, problem solving skills, and training/experience outside of flying likely would have been key proponents of their success. Colonel Chris Hadfield is an excellent example of this. Colonel Hadfield was the first Canadian commander of the International Space Station, starting his career as a fighter pilot in the RCAF. Hadfield had also graduated from the Royal Military College with a mechanical engineering degree. Due to the nature of what pilots have to do physically and mentally, they are screened for specific attributes early at the recruiting centre, and then quickly learn about situational awareness, risk, and communication through pilot training. However, a

[175] DND, Con*ceptual Foundations,* 122.
[176] English, "The Masks of Command," 17.

blanket statement cannot be made that flying ability implies leadership ability. It was recognized in WWII that "even a very good pilot may be a bad leader."[177] This still holds true today. Equally, those who have received excellent leadership training may still be weak leaders later in their careers.

The counterargument may be that pilots are naturally a better fit for some of key leadership and ops positions because of the operations knowledge acquired in their daily routines. This may be true based on the current setup. If pilots continued to own most of the key leadership positions and they were given leadership training, it would solve the problem partially. Sufficient time would still likely not be able to allow pilots to be highly proficient and exceptional organizational leaders at the same time. For the RCAF to maximize its effects, it should not limit the potential of its organization by limiting opportunities for non-pilots to gain experience in ops. It may turn out that the best fit for a key position is a pilot but in some cases there will be non-pilot individuals who are better suited to build an effective team and can maximize airpower outputs.

It became evident throughout WWI and WWII that innovation was synonymous with technical specialities, advanced pilot training, and increased support and coordination for the RCAF. In future operations, this is expected to be no different. It will be essential for individuals to function at their maximum potential to meet the complexities of operations. This means that individuals from specialized occupations (i.e. pilots, doctors, lawyers, or weapons technicians) will need to hone their skills in order to be proficient at their craft when operations become difficult. The FAOC further substantiates this requirement by stating, "if core capabilities are left unattended for air

[177] English, Cream of the Crop, 97.

forces, this is the first step in an increasingly one way slide towards irrelevancy."[178]In some future missions, pilots flying in operations may be only include those who have perfected their skills and became experts in the cockpit, rather than pilots who have met minimums only. This could potentially preclude key leadership positions flying in cockpits in the future. For example, for a high-risk combat mission, it may actually introduce risk to the crew and the operation to have a CO or a WComd, who has simply maintained yearly minimums, flying in the front seat. Similarly, it may not make sense to have the CO of a fighter squadron be the first to engage an enemy in a volatile situation for example. In these scenarios, it will be difficult for commanders to comply with the RCAF's stated exceptions, without introducing risk.

The RCAF Flight Operations Manual indicates:

> To provide the requisite leadership to personnel involved in flying operations, WComds are expected to fly regularly, bearing in mind their other commitments and resource management responsibilities. Frequent participation/supervision in the ongoing flying programme is expected, either as a qualified crewmember, or simply as an observer. WComds in designated flying positions who wish to fly in a crew capacity shall maintain an aircrew Category for their aircraft type.[179]

Maintaining situational awareness will always be critical for those in key leadership and ops positions. And obviously there is a difference between being a technical expert and flying regularly. This balance will likely be dependant on responsibilities of the leadership position. If a CO or Ops O for example is not proficient in a specific element of the flying operation, he or she will have to rely on the inputs of other technical experts within the organization, such as a unit flying standards officer. Similar to engineers who have not necessarily worked on aircraft but have to make critical airworthiness decisions,

[178] DND, *Future Air Operating Concept*, 2.
[179] DND, *RCAF Flight Operations Manual*, Chap 3 Sec 2.1 - 9/9.

the input of mechanics and test pilots is heavily weighted. However, there is no doubt that the role of pilots in key leadership and ops positions today is challenging. As operations become more complex, determining how to strike a balance within the current organizational model will be increasingly difficult for pilots as they will be further pulled in different directions.

In Comparison: Technical Expertise in CAF Health Services

To compare how other officers/technical experts are employed in the CAF, health care services provide a good example. Health Care Administrator (HCA) officers "provide leadership and management of health care services and delivery. They apply the principles and practices of health care administration, resource-management organization and operations for the Forces Health Service."[180] Although not health experts themselves (i.e. nurses or doctors), HCA officers learn about the basics of health services through training, in order to understand the nature of the services they are managing. Their responsibilities include ensuring that "the health care system is managed effectively, that health care professionals are able to practice in a safe an efficient environment, and that the CAF members receive high-quality health care wherever they may be."[181] With the emphasis being on efficient resource-management, outputs and optimization will naturally be the focus of their job.

On the other hand, MOs are responsible for providing primary health care, practicing environmental medicine, promoting health protection and education, and

[180] Department of National Defence, "Health Care Administrator," last modified May 30, 2018, https://www.canada.ca/en/department-national-defence/services/caf-jobs/career-options/fields-work/administration-support/health-care-administration-officer.html.
[181] *Ibid.*

leading clinical teams of highly trained individuals.[182] For the CAF to train medical doctors, a significant investment in time and money is required, much like pilots. Therefore doctors, like pilots, receive higher pay incentives since as they are considered highly specialized occupations.

Based on a conversation with a HCA officer who has managed clinics for the past 15 years, it was learned that in some cases it is not advantageous for the organization to assign a medical doctor to a management positions, based on the need for their technical skills at the 'front line.' Therefore the decisions on who to place in key leadership and management positions in medical facilities are usually determined by supply and demand. There are a minimum number of MO positions that the CAF must fill, in order to provide sufficient health care to its members. Therefore, in some cases there may be no discussion, and the clinical team leader needs to be a HCA officer. However, in order for MOs to move up in rank, they need a path that provides stepping-stones to get there. This may mean in some cases the organization loses an excellent highly skilled doctor.

At the same time, MOs are selected for key positions based on merit, qualifications, management, and leadership skills. Health Services does not constrain itself by meeting occupation quotas in key leadership positions but rather, ensures that the individual is the best fit for the job.[183] When filling positions with MOs or HCA officers, the priority is to match qualifications and personal qualities with certain management jobs, and certain medical qualifications with medical roles. The HCA officer emphasized that when selecting individuals, the focus is always on aptitude, and occupation does not limit the

[182] Department of National Defence, "Medical Officer," last modified June 11, 2018, https://www.canada.ca/en/department-national-defence/services/caf-jobs/career-options/fields-work/health-care/medical-officer.html.

[183] Discussion with a LCol HCA officer in May 2018.

individuals' potential to be selected for a key leadership position. This model sets up the organization to maximize its outputs, and in some cases this means that the best MOs will be delivering specialized health care to patients rather than managing the operation.

In future RCAF operations, the expectation for individuals to function at their maximum potential to meet the complexities of operations is no different. For the organization to deliver relevant, responsive and effective airpower, all occupations should be performing where they can best benefit the operation. For example, removing an excellent highly skilled pilot from a flying position in order to fill a key leadership position may be detrimental to the organization. He or she may not want to move up and equally, their leadership abilities may be mediocre in comparison with their flying abilities.

The fact that some pilots are forced to move into non-flying roles has also led to some discontent in the occupation, and in some cases voluntary releases have resulted. Although this paper does not analyze the root of pilot retention issues in the RCAF, the Director Military Careers office has provided the following statistics. The preferred manning level (PML) for pilot positions is 1368 in the RCAF, but at 1122 the actual trained pilot strength is 18% below its target. However, note that these numbers are not broken down into flying positions. If the RCAF was able to focus on filling flying positions (i.e. flight training required) separate from its leadership positions (any occupation, merit-based) potentially it more easily reach its targets and would then have experts in pilot positions and experts in leadership/management positions. This would likely improve the RCAF's overall effectiveness. However, with the information

available, what can be deduced is that when comparing the manning levels that the RCAF has pre-determined, the gaps are likely in both flying positions and leadership positions.

In comparison, the air logistics occupation is over PML by 5% (612/583), the AERE occupation sits at 96% (658/685), and the CELE occupation is currently at 87% of its PML.[184] With the pilot occupation currently at 82% of PML, continuing to push pilots in leadership positions as operations become more complex may further weaken the pool of pilot technical ability in the RCAF. Additionally, with other occupations having healthier numbers it may in fact reduce risk for the RCAF by opening up leadership positions to non-pilot occupations.

Ops Positions in Allied Countries (UK and Australia)

To better assess the current RCAF organizational structure, it is beneficial to compare it with the model of our allies. The RAF for example, had similar challenges as the RCAF with respect to pilots having to be excellent pilots and still perform in command, management, and ops roles. Although it is not impossible, it extremely difficult to do all roles well. Therefore, the RAF has developed an air operations support branch to remove the requirement of pilots filling roles in ops centres, similar to the HCA occupation. A new air operations support branch was created that included the new occupations of "Flight Operations Assistant" and "Aerospace Systems Operator." Respectively, their responsibilities are to "provide aircrews and air traffic controllers with the information to plan and execute missions safely," and "manage sophisticated sensors,

[184] Department of National Defence, "Trained Strength vs Trained Effective Establishment/Preferred Manning Level Fiscal year 2017/2018," *Annex B to 555-1 (DPGR 5*) (2018) and discussion with Air Log Career Manager.

communication and computer tracking aircraft, ships and potential threats."[185] This limits the pressure that is placed on the organization when pilots are removed from their flying roles to work in ops centres, leaving gaps in flying experience. As a result, of having dedicated air operations support, the organization is better able to focus on optimizing outputs and meeting set targets. However, most command and management positions that oversee operations in the RAF are still limited to pilots.

The Royal Australian Air Force (RAAF) has a similar setup whereby they've developed an "Ops Officer" occupation to "assist in the mission planning, tasking, coordination and monitoring or air operations within single service, joint and combined air operations environments." This occupation is a new direct-entry reserve occupation that allows individuals to directly join the RAAF as an ops officer. This cadre augments the full-time pilots who are already working in ops positions, preventing the removal of some pilots from flying duties. In the current RCAF model, fighter pilots for example, are removed from flying duties to fill ops roles. And although it is generally accepted that key leaders are no longer able to be 'experts' in their flying role, it is still expected that pilots in ops centres maintain a high level of proficiency so that they can contribute to flying outputs in the RAAF.

This review of operations in the UK and Australia demonstrates that flying competency is not a requirement for individuals to be effective in air force ops positions. With the right individuals and the right experience/exposure, other occupations could also be effective in these roles.

---

[185] Royal Air Force Regular and Reserve, "Find your Role," last viewed June 15, 2018, https://www.raf.mod.uk/recruitment/roles/roles-finder/ and discussions with current pilot Major in the RAF.

CHAPTER 7: CONCLUSION

The aim of this study was to examine the long-standing rationale for pilots dominating the RCAF's leadership and ops positions at the tactical and operational levels, in order to recommend the best organizational and leadership model for the future of the RCAF.

Through a historical review of the RAF it became evident that successful leaders in key positions were not always limited to the pilot occupation. In fact, examples in WWI included cavalry officers who were able to effectively lead airmen and airwomen based on their exceptional leadership abilities. As the war became more complex, the RAF developed new officer and NCO occupations in order to meet the demand. However, when the war was over, the RAF was forced to downsize, leaving pilots to carry out new functions such as armament, navigation, and photography in addition to their regular flying duties.

The resource-constrained interwar period led to pilots occupying most key leadership and ops roles in the RAF, which author Allan English refers to as the beginning of the "cult of the pilot." This new model was further solidified by Sir Hugh Trenchard who believed that the role of pilots should permanently include other "general duties," similar to his former duties when he was a cavalry officer just a few years earlier. Britain's influence on Canada was evident throughout WWI and the interwar period, so much so, that the RCAF adopted a similar leadership and organizational model in which pilots also occupied most key leadership and ops positions.

A review of the concept 'leading from the front' from an army perspective revealed that the meaning has changed in modern-day context. Historically, commanders had to be

in the front of their soldiers facing the enemy, carrying out soldier skills in order to see and understand the operation and make informed decisions. Although it is still a possibility for a full battalion to deploy with a CO in the lead today, it is extremely rare. Technological advancements on the battlefield have enabled Army COs to best influence the battle from a better vantage point, further in the rear. Current operations are much more dispersed and complex, requiring key leaders to be in the rear in the ops centre in order to see the full battle space and maintain awareness of the various assets that are deployed. However, army commanders will still visit subordinates in the field in order to gain an appreciation of the operation in real-time and 'lead by example' by sharing risks and hardships.

The RCAF, however, has not evolved to the same degree as the army. Air Force doctrine has changed but its application of 'leading from the front' has been slower to evolve. Although deploying large formations of aircraft towards the enemy is no longer part of air force doctrine, and full situational awareness is offered in the rear, there is still pressure within the air force to have pilots filling most key leadership and ops roles so that they can fly near 'the front line.' The RCAF still advocates that this is how its leaders must demonstrate sharing risk and hardship.

This paper has argued that it is flawed to apply the legacy concept of 'leading from the front' to a different era in the same manner. It is no longer necessary for a CO or Ops O for example to pilot an aircraft to demonstrate competency, share and understand risk, and coordinate/manage operations. He or she is able to see unit assets from an ops centre, and can remain connected with their personnel through visits to subordinates in the field, at home base (where the majority of the unit is typically located), or as a passenger in the

aircraft when the situation permits. The requirement for air force leaders to be forward will be even further diminished as assets become even more technically (advanced) complex or remotely operated.

A study of future air operations highlighted that the RCAF will need to be prepared to respond to a wide spectrum of tasks ranking from MOOTW to high intensity/anti-access operations with its small force. Therefore, the Canadian government has called for an integrated, agile, and balanced approach to tackle new dynamic security threats. This is aligned with the CAF's definition of effective organizations, which emphasizes internal integration and external adaptability. However, the RCAF's current organizational structure limits most of its key leadership and ops positions to pilots, which means it does not always get the best person for the job. Also, having ops planning teams built from mainly one occupation creates a bias and sometimes does not put the required emphasis on other critical elements of the operation. As a result, ops centres do not necessarily function to their maximum potential because they don't include all of the key components of the air ops team.

Following the analysis of future operations, several of Air Canada's key practices were discussed in order to highlight processes that the RCAF could potentially benefit from. Direct observation at the company demonstrated that unlike the Air Force, Air Canada has invested significant effort to optimize the efforts and processes within its ops centre for maximum output. All aspects of its organization, such as passenger movement, maintenance, and logistics, are considered before decisions were made. People were placed in leadership positions based on performance, and abilities, rather than simply previous occupation. And lastly, the study revealed that a clear mission was promulgated

to employees, along with targets and measures of success, to ensure focus and to increase the company's chances of success.

It was determined that there was no direct correlation between a pilot's technical ability and his or her leadership ability. In fact, unlike other occupations in the RCAF, pilots do not typically get the opportunity to lead airmen and airwomen until they are in the Major rank, much later than their peers. A review of the RAF and RAAF proved that they too have struggled with the strain on pilots to perform both flying tasks and fill operations duties. Therefore, both air forces have developed an air ops occupation, enabling the organizations to keep pilots focused on technical ability and skills. Through discussion with a military hospital manager and research of the HCA occupation, it was unveiled that the health care branch does not limit key leadership positions to health care managers or technical experts (i.e. doctors). Rather, the placement of individuals in the 'right person for the job' is the aim, along with maintaining a balance within the organization.

This paper has demonstrated that in order for the RCAF to provide relevant, responsive, and effective airpower in future operations, it needs open its key leadership positions to all air force occupations, and diversify its op centres. This will enable the organization to select the best person for the job, setting the conditions for the RCAF to perform at its maximum potential when faced with the complexities of future operations.

Annex A: Supplementary Definitions

Efficient - Performing or functioning in the best possible manner with the least waste of time and effort.[186]

Effective - Adequate to accomplish a purpose; producing the intended or expected result.[187]

Optimized - As functional as possible.[188]

Airpower - From the Canadian Forces Air Doctrine (2016): airpower is "that element of military power applied within or from the air environment to achieve effects above, on, and below the surface of the Earth. Requires sound, well-defined air doctrine.[189]

[186] Gareth Goh, "The Difference Between Effectiveness and Efficiency Explained," *Insight Squared*, last modified August 9, 2013, http://www.insightsquared.com/2013/08/effectiveness-vs-efficiency-whats-the-difference/.

[187] Gareth God, "Effectiveness and Efficiency."

[188] Merriam-Webster, "Optimize" definition, last accessed May 15, 2018, https://www.merriam-webster.com/dictionary/optimize.

[189] DND, *Canadian Forces Air Doctrine*.

Annex B: List of RCAF officer occupations

Aerospace Control Officer;
Aerospace Engineering Officer;
Air Combat Systems (AERE) Officer;
Communication Electronics Engineering (CELE) Officer;
Construction Engineering Officer;
Health Care Administrator Officer;
Intelligence Officer;
Legal Officer;
Logistics Officer;
Medical Officer (Doctor);
Military Police Officer;
Nursing Officer;
Pharmacy Officer;
Physiotherapy Officer;
Pilot; and
Public Affairs Officer.[190]

[190] Department of National Defence, "Find a job in the Canadian Armed Forces," last viewed June 25, 2018, https://www.canada.ca/en/department-national-defence/services/caf-jobs/browse-jobs.html.

Annex C: Breakdown of RCAF Functional Areas

1. Surveillance	Integrate into the Military Integrated Information Infrastructure (MI3), enable detection and tracking of targets, need current surveillance of entire country so that appropriate decisions can be made;
2. Aerospace Defence of Canada	Seamlessly and continually link systems that share information with the Army, Navy and US Air Force, as well as information from civilian-radar and air-traffic-management systems. Requires rapid decision-making;
3. Support to Maritime	Extending rang Navy platforms with air assess to provide timely and coordinated responses to airborne, surface, and subsurface targets detected through surveillance. Share information with the Navy, Special Operations Forces (SOF) and Other Government Departments (OGDs). Requires close integration with legal authorities and appreciation for Rules of Engagement (ROE);
4. Support to Land Ops	Provide control of the air, strategic (i.e. cargo transport) to tactical air mobility and direct support to the Army, SOF and disaster assistance units. Adapt to rapidly changing environments and maximize the resources allocated to the land operations;
5. Search and Rescue (SAR)	24/7 coordinated response. Need more innovative methods, such as multirole fleets and use civilian contractors;
6. Support to the Civil Power	Ability to rapidly accommodate security partner capabilities to facilitate interoperability on missions;
7. Aerospace Defence for North America	Conventional and asymmetrical threats. Must destroy, capture or escort the targets. Integrate with the US, share information with Army, Navy and US Air Force. Clear understanding of NORAD and US Command and Control concepts. Speed and range of weapons is important;
8. RCAF Support to Continental	Defence against military threats and contribute to civil powers in response to natural or man-made disasters;
9. RCAF Operations in low-intensity	Ability to rapidly deploy and sustain forces in austere and partially denied environments (includes counter-insurgency). Integrate with Army, Navy and OGDs. Airpower response should be /proportional to the

	conflict;
10. RCAF Operations in High Intensity A2/AD	Participate in coalition in a contested environment. Offensive and defensive space and cyber warfare; and
11. RCAF Support to Non-combat MOOTW	Could influence moving Disaster Assistance Response Team (DART) to a location affected by a natural or man-made disaster.

BIBLIOGRAPHY

Air Canada. “2017 Annual Information Form.” (19 March 2018).

Air Canada. “Corporate Profile.” Last viewed June 1, 2018. https://www.aircanada.com/ca/en/aco/home/about.html.

Air Canada. “Maintenance Excellence 5.0, People, Process, Technology.” (2018).

BBC News. “Has History Misjudged the Generals of World War One?” Last viewed June 15, 2018. http://www.historyofmacedonia.org/AncientMacedonia/AlexandertheGreat.htmlas.

Bingham, H. *An Explorer in the Air Service.* New Haven, CT: Yale University Press, 1920.

Bang, D. and Frith Chris D. “Making Better Decisions in Groups.” *US National Library of* Medicine *National Institutes of Health*. Last modified August 16, 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5579088/.

Bowyer, C. *History of the RAF*. London: Hamlyn, 1977.

Caffarena, Fabio. “Air Warfare (Italy).” *International Encyclopedia of the First World War.* Last modified October 8, 2014. https://encyclopedia.1914-1918-online.net/article/air_warfare_italy.

Canadian War Museum. “The Royal Canadian Air Force.” *Canada and the Second World* War. Last viewed June 15, 2018. https://www.warmuseum.ca/cwm/exhibitions/chrono/1931rcaf_e.shtml.

CBC News. “A history of Canada’s CF-18 Hornets.” Last modified March 2, 2017. http://www.cbc.ca/news/canada/cf-18-hornets-1.1003648.

CTV News. “Canada sending 3 military choppers to assist in Philippines relief effort.” Last modified November 16, 2013. https://www.ctvnews.ca/canada/canada-sending-3-military-choppers-to-assist-in-philippines-relief-effort-1.1546283.

Department of National Defence. “1 Canadian Air Division.” *Royal Canadian Air Force*. Last modified November 30, 2017. http://www.rcaf-arc.forces.gc.ca/en/1-cdn-air-div/index.page.

Department of National Defence. “Airlift Command and Control – Operation Hestia.” *Canadian Forces Aerospace Warfare Centre, Lesson Analysis Project – Findings Report* (2010).

Department of National Defence B-GA-400-000/FP-001. *Canadian Forces Air Doctrine*. Ottawa: Royal Canadian Air Force, 2016.

Department of National Defence. "Canadian Forces School of Aerospace Technology and Engineering (CFSATE) History." *Royal Canadian Air Force*. Last modified July 5, 2018. http://www.rcaf-arc.forces.gc.ca/en/training/cf-school-aerospace-technology-engineering.page.

Department of National Defence. "Commander of the Royal Canadian Air Force." *RCAF*. Last modified May 4, 2018, http://www.rcaf-arc.forces.gc.ca/en/rcaf-commander.page.

Department of National Defence. "Current Operations List," last modified May 29, 2018, http://www.forces.gc.ca/en/operations/current-list.page.

Department of National Defence. "Fighter Jets." Last modified December 13, 2017. http://www.forces.gc.ca/en/business-equipment/fighter-jets.page.

Department of National Defence. "Find a job in the Canadian Armed Forces." Last viewed June 25, 2018. https://www.canada.ca/en/department-national-defence/services/caf-jobs/browse-jobs.html.

Department of National Defence. *Future Concepts Directive Part 2: Future Air Operating Concept.* Ottawa: Royal Canadian Air Force, 2016.

Department of National Defence. "Health Care Administrator." Last modified May 30, 2018,
https://www.canada.ca/en/department-national-defence/services/caf-jobs/career-options/fields-work/administration-support/health-care-administration-officer.html.

Department of National Defence. *Leadership in the Canadian Forces, Conceptual Foundations.* Kingston: Canadian Defence Academy – Canadian Forces Leadership Institute, 2005.

Department of National Defence. "Medical Officer." Last modified June 11, 2018. https://www.canada.ca/en/department-national-defence/services/caf-jobs/career-options/fields-work/health-care/medical-officer.html.

Department of National Defence. *RCAF Flight Operations Manual*. Ottawa, 2017.

Department of National Defence. "Royal Canadian Air Force Overview." Last modified July 5, 2018, http://www.rcaf-arc.forces.gc.ca/en/overview.page.

Department of National Defence. "RCAF Celebrates 93 years of service." *RCAF*. Last modified July 6, 2018. http://www.rcaf-arc.forces.gc.ca/en/article-template-standard.page?doc=rcaf-celebrates-93-years-of-service/j0ts9pds.

Department of National Defence. “Strong, Secure, Engaged.” *Canada’s Defence Policy* (2017).

Department of National Defence. “Trained Strength vs Trained Effective Establishment/Preferred Manning Level Fiscal year 2017/2018.” *Annex B to 555-1 (DPGR 5*) (2018).

Department of National Defence. “Waypoint 2018: The Canadian Army Advancing Toward Land Operations 2021.” Canadian Army Land Warfare Centre (2015).

Douglas, W.A.B. *The Official History of the Royal Canadian Air Force*, vol. 2, *The Creation of a National Air Force.* Toronto: University of Toronto Press, 1986.

Editorial Board. “A Step Closer to the True Story of the plan shot down over Ukraine.” The Washington Post. Last modified May 26, 2018. https://www.washingtonpost.com/opinions/a-step-closer-to-the-true-story-of-the-plane-shot-down-over-ukraine/2018/05/25/e8396ca2-6043-11e8-b2b8-08a538d9dbd6_story.html.

English, Allan, D. “Leadership and Command in the Air Force: Can Non-Aircrew Command Flying Squadrons?” In *6th Annual Air Force Historical Conference. Proceedings: Canada’s Air Force from Peace to War, 79-86.* Office of the Air Force Heritage & History, 2000.

English, Allan D. *The Cream of the Crop, Canadian Aircrew 1939-1945.* Montreal & Kingston: McGill-Queen’s University Press, 1996.

English, Allan D. “The Masks of Command: Leadership Differences in the Canadian Army, Navy and Air Force.” In *The Operational Art: Canadian Perspectives, Leadership and Command.* Kingston: Canadian Defence Academy Press, 2006.

English Oxford Living Dictionaries, “When the Balloon goes up,” last viewed June 1, 2018, https://en.oxforddictionaries.com/definition/when_the_balloon_goes_up.

Gareth Goh. “The Difference Between Effectiveness and Efficiency Explained*.” Insight Squared*. Last modified August 9, 2013, http://www.insightsquared.com/2013/08/effectiveness-vs-efficiency-whats-the-difference/.

Grzebieta, Raphael. “Influence of Cognitive Biases in Distorting Decision Making and Leading to Critical Unfavorable Incidents.” *MDPI Safety.* Last modified November 3, 2015. http://www.mdpi.com/2313-576X/1/1/44/htm.

Halliday, Hugh A. "The NCO Pilots: Air Force, Part 11," *Legion Canada's Military History Magazine,* last modified September 1, 2005, https://legionmagazine.com/en/2005/09/the-nco-pilots/.

Historica Canada. "Battle of Vimy Ridge." Last viewed June 15, 2018. https://www.thecanadianencyclopedia.ca/en/article/vimy-ridge/

Historica Canada. "Peacekeeping." Last viewed June 15, 2018. http://www.thecanadianencyclopedia.ca/en/article/peacekeeping/.

Juno Beach Centre. "*Canada in the Second World War - Fighter Formations*." Last viewed May 15, 2018. https://www.junobeach.org/canada-in-wwii/articles/rcaf-fighter-squadrons-overseas/fighter-formations/.

Liddell Hart, B.H. *History of the First World War.* London: Pan Books, 1972

Liddell Hart, B.H. *Revolution in Warfare*. London: Faber and Faber, 1947.

Lloyd, R, Commander Royal Canadian Navy, *briefing to the Joint Command and Staff College, Canadian Forces College,* 17 May 2018.

Rouleau, M.R., Commander CANSFOCOM, *briefing to the Joint Command and Staff College, Canadian Forces College,* 19 April 2018.

Lockie, A. "The Air Force Just Demonstrated a Fully Unmanned F-16 Fighter Jet." *Business Insider.* Last modified April 12, 2017. https://taskandpurpose.com/unmanned-f-16-fighter-drone/.

March, Bill. "A brief timeline of military aviation training in Canada." *Royal Canadian Air Force*. Last modified August 10, 2017. http://www.rcaf-arc.forces.gc.ca/en/history-heritage/royal-flying-corps-canada/timeline.page.

McCallum, John S. "Adapt or Die." *Ivey Business Journal*. Last modified December 2001. https://iveybusinessjournal.com/publication/adapt-or-die/.

McChrystal, S., Fussell, C., Collins, T., and Silverman, D. *Team of Teams: New Rules of Engagement for a Complex World.* Portfolio: Penguin Books USA, 2015.

McCombs School of Business. "Self-Serving Bias." *Ethics Unwrapped*. Last viewed June 15, 2018. https://ethicsunwrapped.utexas.edu/glossary/self-serving-bias.

Merriam-Webster. "Optimize" definition. Last accessed May 15, 2018. https://www.merriam-webster.com/dictionary/optimize.

Millar, D.B. "Why Can't I be CDS." *Unpublished Paper, Canadian Forces Joint Command and Staff Program* (1997).

Potter, Stephanie E. “Smile and Carry On: Canadian Cavalry on the Western Front, 1914-1918.” *The University of Western Ontario.* Last modified April 2013. https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=2544&context=etd.

Project of History of Macedonia. “Alexander the Great.” Last viewed June 15, 2018. http://www.historyofmacedonia.org/AncientMacedonia/AlexandertheGreat.html

Roland, Alex. “War and Technology.” *Foreign Policy Research Institute*. Last modified February 27, 2009. https://www.fpri.org/article/2009/02/war-and-technology/.

Royal Air Force Regular and Reserve. “Find your Role.” Last viewed June 15, 2018. https://www.raf.mod.uk/recruitment/roles/roles-finder/

Rouleau, M.R., Commander CANSFOCOM, *briefing to the Joint Command and Staff College, Canadian Forces College*, 19 April 2018.

The National Archives, Ministry of Defence. “Trenchard: Father of the RAF.” Last modified April 2, 2008. http://webarchive.nationalarchives.gov.uk/+/http://www.mod.uk/DefenceInternet/DefenceNews/HistoryAndHonour/TrenchardFatherOfTheRaf.htm.

Time. *The Weekly Newsmagazine*, 11 Feb (1956).

Time. *The Weekly Newsmagazine*, 22 Feb (1956).

Veterans Affairs Canada. “The Canadian Armed Forces and the Gulf War.” Last modified November 27, 2017, http://www.veterans.gc.ca/eng/remembrance/history/canadian-armed-forces/persian-gulf.

Winter, Denis. *The First of the Few: Fighter Pilots of the First World War.* London: Penguin, 1982.

Wise, S.F. *Canadian Airmen and the First World War, The Official History of the Royal Canadian Air Force Volume I*. Toronto: University of Toronto Press, 1980.

Woolf, Christopher. “The Day Tanks Changed War Forever.” *Public Radio International (PRI).* Last modified September 15, 2016. https://www.pri.org/stories/2016-09-15/day-tanks-changed-war-forever.