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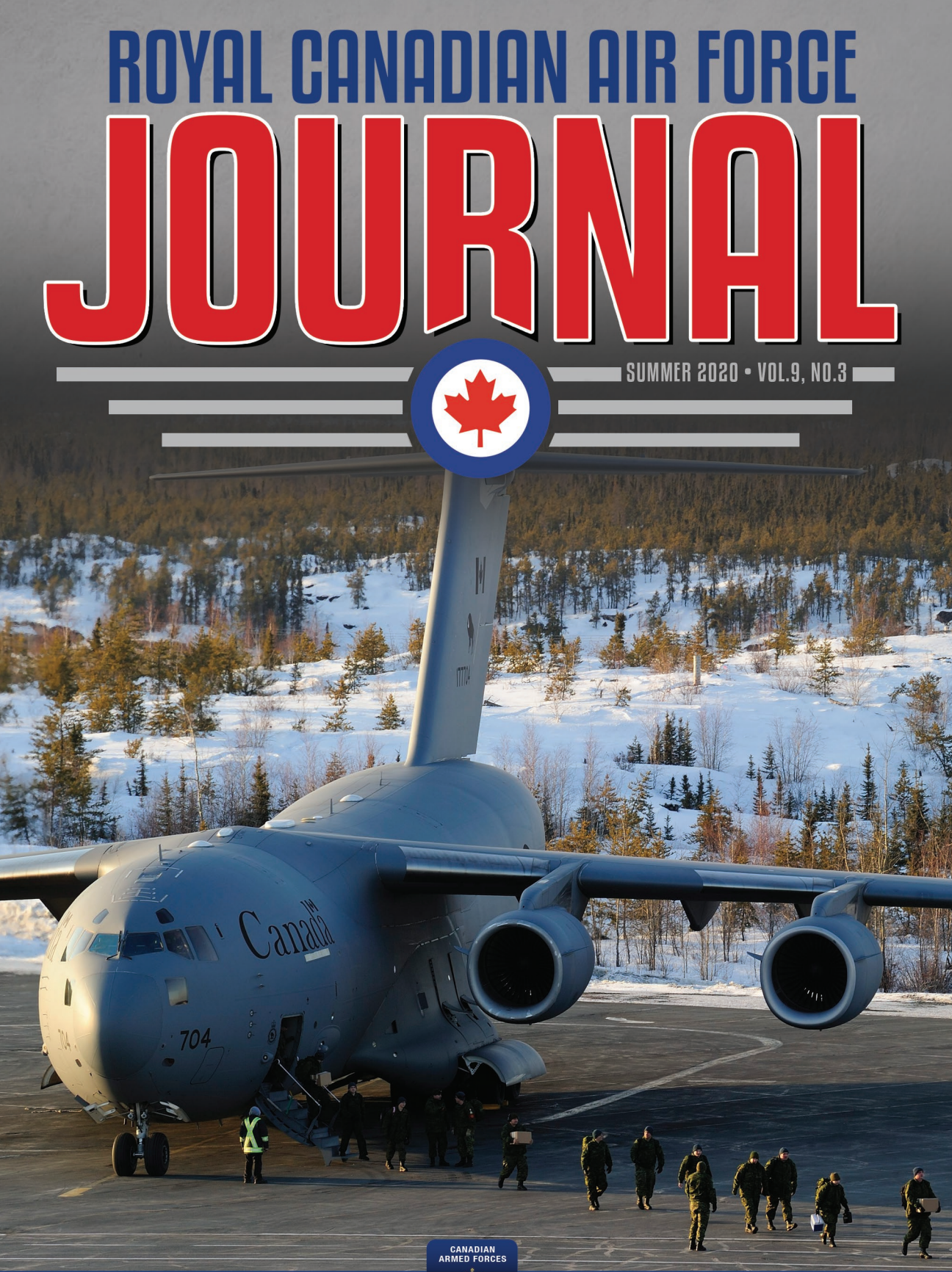

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The *ROYAL CANADIAN AIR FORCE JOURNAL* is an official publication of the Commander Royal Canadian Air Force (RCAF) and is published quarterly. It is a forum for discussing concepts, issues and ideas that are both crucial and central to air and space power. The *Journal* is dedicated to disseminating the ideas and opinions of not only RCAF personnel, but also those civilians who have an interest in issues of air and space power. Articles may cover the scope of air-force doctrine, training, leadership, lessons learned and air-force operations: past, present or future. Submissions on related subjects such as ethics, technology and air-force history are also invited. This journal is therefore dedicated to the expression of mature professional thought on the art and science of air warfare and is central to the intellectual health of the RCAF. It serves as a vehicle for the continuing education and professional development of all ranks and personnel in the RCAF as well as members from other environments, employees of government agencies and academia concerned with air-force affairs.

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ROYAL CANADIAN AIR FORCE JOURNAL

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The *ROYAL CANADIAN AIR FORCE JOURNAL (RCAFJ)* welcomes the submission of articles, book reviews and shorter pieces (which will be published in the Letters to the Editor, Points of Interest, Pushing the Envelope and Point/Counterpoint sections) that cover the scope of Air Force doctrine, training, leadership, lessons learned and Air Force operations: past, present or future. Submissions on related subjects such as ethics, technology and Air Force history are also invited.

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ITEM	WORD LIMIT*	DETAILS
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CALL FOR SUBMISSIONS

For the Winter issue: **30 October**

For the Spring issue: **30 January**

For the Summer issue: **30 April**

For the Fall issue: **30 July**

DISCLAIMER

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EDITOR'S **MESSAGE**

This summer 2020 issue of the *Royal Canadian Air Force Journal* showcases some of our junior officers, as the articles were written by students in the Air and Space Power Operations Course.[1] The broad nature of these articles demonstrates the expanse of expertise within this group of up-and-coming members. Based on the discussions between directing staff and students, there is no lack of ideas on how to move the Royal Canadian Air Force (RCAF) forward.

As Canada continues to struggle with defending the Arctic, Captain Cabot puts forward the concept of airships operating in the Far North. Captain Cabot examines the technical challenges of operating in this environment and the issues associated with meeting the current capability gaps. The article addresses the concepts of intelligence, surveillance and reconnaissance as well as air mobility via dirigibles.

The second article, written by Captain Julian, also focuses on the Arctic but engages the challenges from a different perspective. Captain Julian looks at the history of Canadian military development of Arctic infrastructure in support of operations from the Cold War era to the present. He then proposes a renewed investment in Arctic hub development. The result would be a more efficient application of air power with greater endurance.

The third article moves to the issue of human resource management and RCAF succession planning. Captain Strong explores the challenges of selecting the right people to lead air power in the RCAF. To assist in this exploration, Captain Strong leans on lessons learned in industry. The article challenges the reader to think about how RCAF leadership is currently managing and developing our personnel and to consider future improvements.

In the fourth article, Captain Black examines the human resource issue of leadership and the biases and opportunities associated with introverts and extroverts. The work environment in general affects introverts and extroverts in different ways. To make the most of our future leaders, our current leaders have to know how to get the best out of their people.

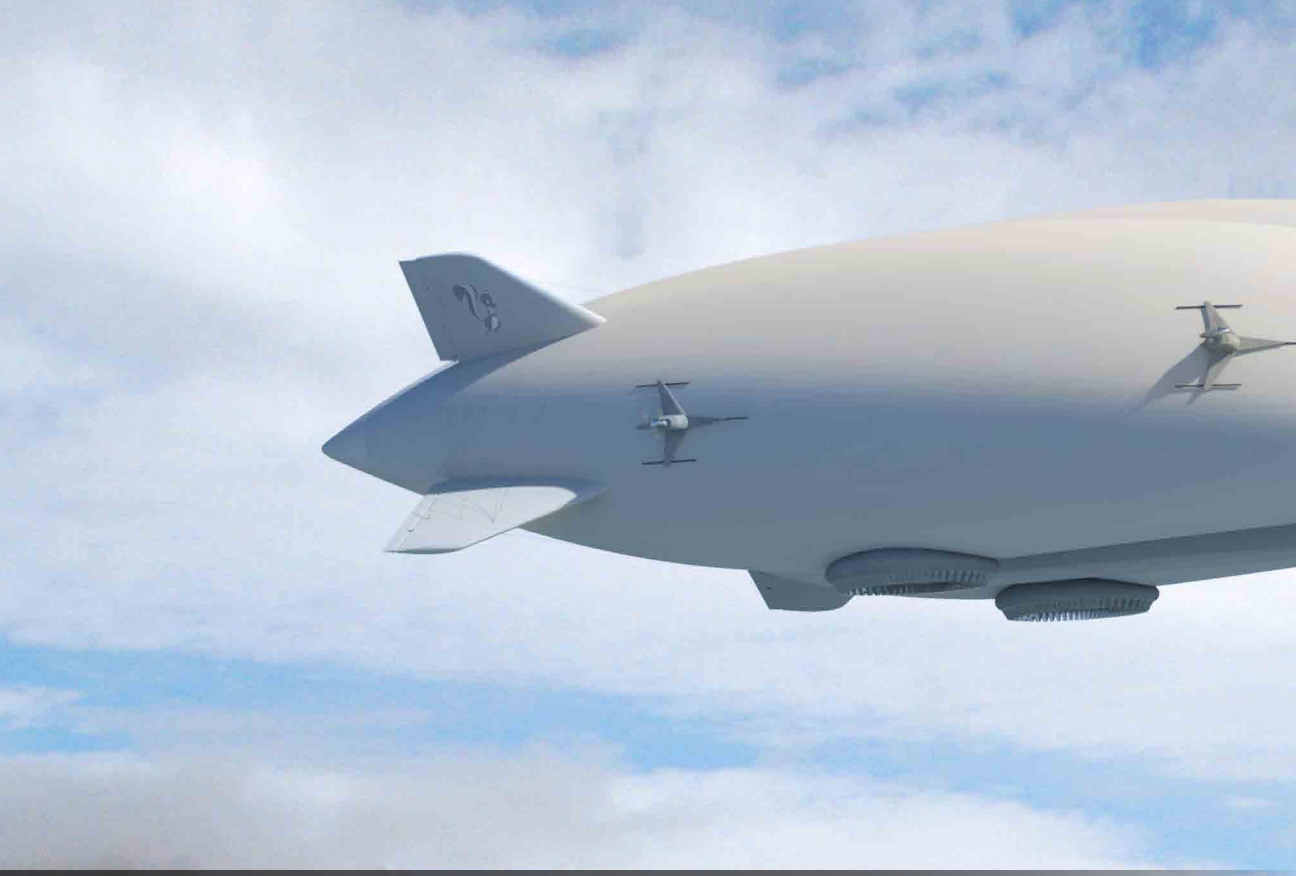
Finally, the fifth article takes a look at the whole-of-government approach to interventions in failed states and the desire to employ RCAF assets; however, these assets may not be the most suitable for the tasking. Captain Sollow makes the point that, if we are going to intervene in failed and failing states, the whole-of-government approach needs to be better planned to actually achieve desired results.

As always, enjoy the read, and I look forward to your thoughts.

Sic Itur Ad Astra

Lieutenant-Colonel Doug Moulton, CD, MBA

1. The Air and Space Power Operations Course is designed to foster an air and space power mindset, hone staff skills and teach all phases of integrated air operations. It is meant to develop RCAF officers capable of executing staff officer duties, being effective leaders and conducting integrated air operations at the wing, air task force and air component levels. The course is offered at the RCAF Aerospace Warfare Centre.



The Role of Airships in Defending Canada's Arctic Sovereignty

BY CAPTAIN CATHERINE CABOT

Editor's note: This paper was written by a candidate attending the Air and Space Power Operations Course in fulfilment of one of the requirements of the course of study.

INTRODUCTION

As climate change is increasing the Arctic's accessibility, global interest in the region is at an all-time high. For instance, China recently shared its Arctic ambitions with the world by publishing its first White Paper on Arctic policy. Typically considered a non-Arctic state, China's policy highlights its intention to exploit commercial opportunities such as a "Polar Silk Road" bridging China to Europe through the Arctic.[1] Meanwhile, Russia is concerned about protecting $30 trillion of unexploited natural resources in the Arctic.[2] As such, the Russians are gradually asserting an aggressive military posture by reviving military bases in the Arctic and equipping them with anti-ship missile launchers and air defence systems.[3]

The rapidly changing situation in the Arctic poses a threat to Canada's sovereignty. Unfortunately, experts believe that the Canadian Armed Forces (CAF) lacks the proper capabilities when it comes to fulfilling its mission.[4] In particular, most CAF assets that operate in the Arctic have significant limitations. For example, the North Warning System (NWS) is a binational chain of unmanned radars located across the Arctic to detect aerospace threats. However, it does not have full coverage of the Canadian Arctic and will be obsolete by 2025.[5] Similarly, the CF188 fighter jets primarily operate domestically as interceptors to protect Canadian airspace and are also approaching their end-of-life expectancy.[6] In contrast, the CC177 Globemaster is a newer capability procured for strategic lift, but it can only land on certain airfields in the Arctic.[7]

Strong, Secure, Engaged: Canada's Defence Policy (*SSE*), released in 2017, states that "Canada must enhance its ability to operate in the North."[8] Needed enhancements include the replacement of current capabilities such as the NWS and the CF188 fleet. They also include the introduction of new capabilities, such as spaced-based surveillance, the remotely piloted aircraft system (RPAS) and a fleet of Arctic offshore patrol ships.[9]

Airships are absent from *SSE* but are worth consideration, as they have gained a renewed interest among the defence community. In fact, a wide range of published studies recommend airships for Arctic applications due to their unique characteristics. Moreover, *SSE* encourages innovative solutions to defence challenges, including those in the Arctic.[10] The aim of this article is to show that the CAF would benefit from operating airships to defend Canada's Arctic sovereignty.

This article begins with a brief overview of Arctic sovereignty and modern airship fundamentals. Next, it examines the unique characteristics of airships in the context of military applications in the Arctic. Finally, it assesses the development of airship regulations as well as the current state of the airship industry.

For the purposes of this article, an airship is a dirigible lighter-than-air platform. While airships may be suitable for various applications, the scope of this article covers the preliminary analysis of military applications for joint intelligence, surveillance and reconnaissance (JISR) as well as air mobility. As well, this article only compares the performance of airships to other Royal Canadian Air Force assets and excludes ground-based and maritime-based assets from the analysis. Finally, the scope of this article is constrained to operations in the Arctic and excludes all other geographic locations.

> *SSE* commits the CAF to exercising sovereignty in the Arctic.

BACKGROUND

First and foremost, it is important to understand sovereignty in the context of Canada's Arctic. Current literature offers several definitions of sovereignty. For instance, the Canadian Global Affairs Institute defines sovereignty as the "the absence of any higher authority."[11] On the other hand, Donald McRae proposes that sovereignty is synonymous with independence.[12] Rob Huebert offers the most comprehensive definition as he posits that a state has sovereignty when there exists a governance system within a defined territory that is populated.[13] In other words, a state has sovereignty when it satisfies all three conditions.

The status of Canada's Arctic sovereignty is contentious. Notably, it satisfies only two of Huebert's three conditions: an existing governance system and a population. The federal government has delegated powers to its three northern territories, which are home to over 200,000 Canadians.[14] However, several nations disagree with Canada's geographical boundaries in the Arctic. Some of the most well-known territorial disputes in Canada's Arctic include Hans Island, the Lincoln Sea, the Beaufort Sea and the Northwest Passage.[15] In addition to these disputes, Canada is also concerned with the expected rise in commercial activities in the Arctic due to climate change as well as Russia's increasing capability to project force in North America.[16] As such, *SSE* commits the CAF to exercising sovereignty in the Arctic.[17]

Operating in the Arctic presents many unique challenges in comparison to the rest of Canada. For instance, equipment deployed in the Arctic must be capable of withstanding unpredictable and extreme weather conditions such as high winds and below freezing temperatures. The Arctic also lacks adequate infrastructure such as road networks and runways with the ability to accommodate heavier aircraft. Also, infrastructure development in the Arctic is expensive because of its remote location.[18] Ultimately, CAF assets employed in the Arctic must overcome these challenging operational conditions.

Over the past several decades, there has been a renewed interest in airships for military applications and operations in the Arctic. Since the first appearance of dirigible airships over a century ago, technological advancements have resulted in a variety of airship designs. For instance,

conventional airships rely solely on lighter-than-air gas to derive lift, such as helium or hydrogen. In contrast, hybrid air vehicles (HAVs) utilize a combination of buoyant and dynamic (aerodynamic and propulsive) lift for take-off and landing.[19] There are also developments in the categories of high altitude airships (HAAs) designed to operate over 65,000 feet [19,800 metres][20] and low altitude airships designed to operate under 10,000 feet [3,048 metres].[21] Airship designs now use improved composite materials and integrate technologies such as fly-by-wire controls and modern onboard systems and sensors. Overall, each airship design has its own unique characteristics that may be useful for operating in the Arctic.

ANALYSIS

This section will examine specific characteristics of airships that dictate their suitability for operations in the Arctic. Specifically, it will assess the airship's ability to fulfil two Arctic capabilities defined in *SSE*: JISR and air mobility. This section will conclude with other important aspects of airships to consider, such as the development of aircraft regulations governing airships and the development of the airship industry.

JISR

The first Arctic capability to consider is JISR, which *SSE* defines as "interconnected intelligence collection platforms—including aircraft, remotely piloted systems, land vehicles, ships, submarines, people, and satellites—that have the ability to capture data on points of intelligence interest and exchange data in near real-time."[22] The CP140 Aurora and the RADARSAT satellite constellation are examples of current JISR platforms that operate in the Arctic. The following paragraphs will evaluate the potential of airships to perform a JISR role in the context of persistence (ability to continuously monitor an area of interest) and coverage (maximum surface area available to monitor).[23]

According to B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine*, the persistence of a platform is critical as it "gives a commander influence and presence in an air environment."[24] This is especially relevant when conducting JISR because greater persistence affords more time to collect data. The persistence of an airship is significantly greater than that of traditional aircraft. Depending on the design, the loitering time of an airship can vary from days to months to years. This is because airships expend energy only when actively manoeuvring vice loitering.[25] In fact, Lockheed Martin's HAA advertises its ability to loiter for up to one year.[26] In comparison, the CP140 Aurora is a long-endurance aircraft that only averages 12-hour missions and has recorded a maximum of 17 hours airborne.[27] Airships also offer a similar advantage over RPASs, which average a few dozen hours of endurance. For example, Northrup Grumman's high-altitude, long-endurance Global Hawk has an endurance capability of 32-plus hours.[28] Finally, the persistence of airships also surpasses satellites. Satellites in the low and medium earth orbits only provide periodic coverage of the Arctic. For example, the RADARSAT Constellation Mission will operate in the low earth orbit and visit the Arctic only four times a day.[29] The remaining group of satellites in the geosynchronous orbit do not provide coverage in the high Arctic. Overall, airships provide greater persistence than traditional aircraft, RPASs and satellite constellations.

In addition to persistence, the CAF requires a collection of JISR platforms that are capable of covering the entirety of the Arctic's vast geographical footprint. A 2005 report published by the RAND Corporation and prepared for the United States (US) Army recommended HAAs for military surveillance and communication.[30] Since HAAs operate at almost double the maximum altitude of traditional aircraft, it significantly increases their coverage. The report examined a US Missile Defense Agency–sponsored Advanced Concept Technology Demonstration (ACTD).

The demonstration model can fly at 70,000 feet [21,336 metres] to provide a 314 nautical mile radius line of sight.[31] Notionally, excluding Arctic waters, a single ACTD would be enough to provide coverage equivalent to one quarter of Canada's entire Arctic land mass.[32]

The extensive line of sight of HAAs would also allow the airship to act as a "satellite surrogate" to relay data and communications to other JISR platforms.[33] Satellite surrogates would address the lack of satellite coverage in the high Arctic, which limits the ability for current platforms to reliably relay information above 68° North (N).[34] HAAs also offer more flexibility than satellites because they can rapidly adjust their coverage to respond to a commander's changing needs.[35]

Notwithstanding the superior persistence and coverage of HAAs, it is worth highlighting that they are significantly weather dependent. First, the altitude at which HAAs operate may limit the effectiveness of specific data collection sensors, such as electro-optic systems. Atmospheric conditions typically found at high altitudes, such as cloud presence, adversely impact airborne electro-optic sensors.[36] In this case, the performance of an electro-optic sensor onboard an HAA would be dependent on high-altitude cloud occurrences in the Arctic.

Another weather concern for HAAs is the adverse conditions they may encounter passing through the troposphere and stratosphere to reach 65,000 feet [19,812 metres].[37] Airships are particularly susceptible to turbulence on the edge of jet streams, including the Arctic jet stream at 69° N,[38] which could ultimately destroy an HAA. As such, weather conditions may severely restrict the ascent and descent capabilities of HAAs.

HAAs also offer more flexibility than satellites because they can rapidly adjust their coverage to respond to a commander's changing needs.

Generally, all types of aircraft—including airships—are vulnerable to the severe weather conditions in the Arctic. Strong headwinds hinder the efficiency of airborne platforms and reduce their operating window.[39] Fortunately, the intent of JISR is to operate in an environment with multiple platforms. Thus, HAAs would not operate independently. Ideally, the JISR network would include platforms operating at lower altitudes that perform specific tasks more effectively than the HAA, such as the collection of electro-optic data. Multiple platforms would ensure redundancy in the surveillance network.

AIR MOBILITY

The second Arctic capability to consider is air mobility, which is essentially "the delivery of personnel or material by air."[40] New Initiative no. 106 in *SSE* commits the Defence Team to "enhance the mobility, reach and footprint of the Canadian Armed Forces in Canada's North to support operations, exercises, and the Canadian Armed Forces' ability to project force into the region."[41] As such, the following paragraphs will examine airship mobility in the context of three characteristics of air power: payload (ability to carry supplies), reach (how far they can travel unimpeded) and support dependency (requirement for infrastructure).[42]

Fundamentally, air mobility is the ability to deliver a payload, which is critical for the airlift of troops or supplies to an operational base in the Arctic. A 2013 study conducted by Defence Research and Development Canada (DRDC) recommended the use of HAVs operating at low altitudes to

conduct military heavy lift operations in the Arctic. In particular, these types of airships have a higher payload capacity when operating at a lower altitude, which is typically less than 10,000 feet [3,048 metres].[43] The DRDC study proposed a low-altitude HAV with a 50 tonne payload capacity, which is much larger than the 16 tonne payload capacity of the CC130 Hercules but comparable to the 60 tonne payload capacity of the CC177 Globemaster.[44] However, conceptual designs have proposed airships that can carry payloads up to 500 tonnes.[45]

Perhaps a more comprehensive payload metric is the lift-cost ratio, which compares the operational economics of a platform as the lift-cost rate ($/hour) to the speed (kilometres per hour [km/h]) multiplied by the payload (tonne). Essentially, a lower lift-cost ratio maximizes value for money in terms of speed and payload capacity. The DRDC study shows that the CC177 Globemaster has the best lift-cost ratio at 0.48, followed by the HAV with a lift-cost ratio of 0.78 and the CC130 Hercules with a lift-cost ratio of 1.36.[46] These results reflect the CC177's significant speed advantage over the low-altitude HAV (700 km/h vice 180 km/h). Consequently, airships must rely on navigation techniques that follow pressure and wind patterns to compensate for their speed limitations.[47]

> A more comprehensive payload metric is the lift-cost ratio.

Reach is another important characteristic to consider when discussing air mobility. *Royal Canadian Air Force Doctrine* defines reach as air power that is "unimpeded by surface features such as mountain barriers or water expanses."[48] Airships operating at low altitudes must overcome several challenges with regards to reach. Specifically, in comparison to traditional aircraft, the DRDC study suggested that high mountain ranges may restrict low-altitude HAV routes.[49] This may be an impediment when operating in certain parts of the Arctic, including northern Canada's highest peak in the Arctic Cordillera, which is more than 2,000 metres above sea level.[50] The eastern rim is also fairly mountainous with elevations reaching over 1,500 metres.[51] Furthermore, operating at low altitudes leaves airships more vulnerable to ground projectiles.[52] Fortunately, the risk of ground projectiles in the Arctic is extremely low, as the region is sparsely populated and relatively stable.

Finally, airships require minimal support, which is a significant advantage over traditional aircraft operating in the Arctic. Due to their vertical take-off and landing capability, airships can land on unprepared surfaces, significantly minimizing airfield infrastructure requirements.[53] As a result, airships can transport troops and supplies directly to the staging area.[54] Conversely, the CC177 is unable to deliver this type of "point-to-point delivery service"[55] outside of the operational hubs.

In short, airships are highly desirable for JISR and air mobility roles in the Arctic due to their superior persistence, coverage, payload capacity and minimal support dependencies. Naturally, like all other airborne platforms, there are trade-offs associated with airships. As discussed, the HAA is vulnerable to severe weather conditions. Moreover, the low-altitude HAV typically operates "slow and low," which limits the ability to use direct navigation routes. Ideally, to achieve synergistic effects, the CAF would benefit from employing various types of airborne platforms, including airships, to perform JISR and air mobility in the Arctic.

OTHER CONSIDERATIONS

Notwithstanding the benefits of operating airships to defend Arctic sovereignty, there are two significant considerations that may impact airship developments: the state of the airship regulations governed by Transport Canada and the development of the airship industry. Indeed, both will

dictate whether airships are a viable solution for the CAF in the near future. Given that *SSE* provides a 10-year plan for defence spending, adopting airships should be practicable within a similar time frame.

Airships require their own regulatory framework because they operate differently than traditional aircraft. In fact, experts suggest that an airship is more akin to a "fast boat" than a "slow airplane."[56] However, unlike the US, the absence of airship activities in Canada has allowed Transport Canada to ignore the requirement for robust airship regulations within the Canadian Aviation Regulations (CARs). As a result, the CARs currently lack clear direction on airships. For instance, in Canada a pilot only requires a hot-air-balloon licence to operate airships. This is unsafe because an airship has more complex systems than a hot-air balloon, including engines, control systems and landing gear.[57] In comparison, the Federal Aviation Administration (FAA) lays out specific requirements for obtaining private and commercial airship pilot licenses in the US. Another concern is that the CARs only address the airworthiness certification of airships with a seating configuration of nine seats or less. There are no airworthiness regulations in the CARs for airships with more than nine seats. Accordingly, experts urge Transport Canada to establish adequate airship regulations within the CARs.[58] Transport Canada can accomplish this relatively quickly and easily by using the FAA regulations as a benchmark.

In the meantime, experts posit that the lack of aviation regulations governing airships is a significant barrier to entry into the airship industry.[59] Currently, the airship industry is limited with few readily operable airships. The technology readiness levels (TRLs)[60] of airship designs vary widely within the industry but most are at a TRL of 7,[61] which means that the technology is still in the prototype phase.[62] As a result, it may be several years until airships are ready to operate in Canada's Arctic.

> **Canada is committed to defending its Arctic sovereignty by enhancing its Arctic capabilities.**

Like the US military, the CAF should provide an up-front investment to encourage the development of military airship capabilities. While many airship projects have come and gone, the US military has a history of sponsoring airship projects that have encouraged the industry to advance airship developments. For instance, the US Army initially sponsored a joint-development airship project between Northrup Grumman and Hybrid Air Vehicles to build a long endurance multi-intelligence vehicle.[63] Although the US Army severed ties with these companies in 2012, Hybrid Air Vehicles leveraged the technological advancements and continued to work on the prototype. Now known as the Airlander 10, Hybrid Air Vehicles expects to deliver the first three airships in the early 2020s.[64] Similarly, the CAF should fund airship projects to encourage the development of airships within the industry.

Overall, there is a strong correlation between the absence of airship regulations within Transport Canada and the slow development of airships within industry.[65] Given the current state of the industry, it is unlikely that airships will be available to the CAF in the near future. Nonetheless, the CAF has the ability to influence the growth of the industry by funding airship projects.

CONCLUSION

More than ever, Canada is committed to defending its Arctic sovereignty by enhancing its Arctic capabilities. The CAF assets currently operating in the Arctic are inadequate. Therefore, it is worthwhile to explore non-traditional capabilities such as airships. Previous studies suggest that the unique characteristics of airships make them well suited for military applications in the Arctic.

This article has shown that the CAF would benefit from operating airships to defend its Arctic sovereignty, since they are well suited for JISR and air mobility roles. Specifically, HAAs have superior persistence and coverage over traditional aircraft. This allows HAAs to collect more data for a longer period of time, which make them a valuable asset in the JISR network. On the other hand, low-altitude HAVs have a high payload capacity and minimal support dependencies, which make them well suited for air mobility. Notably, their vertical takeoff and landing capability offers a significant advantage, as it allows them to land in remote locations that do not have runways.

Similar to traditional aircraft, airships also have operational limitations. For instance, HAAs have significant weather dependencies and low altitude HAVs are constrained by the topography of the region. Ultimately, the CAF can overcome these limitations by employing airships in combination with other platforms to achieve synergistic effects.

Finally, it is important to consider two significant impediments that need attention before the CAF can operate airships in the Arctic. Specifically, Canadian airship regulations are not yet adequate as there are issues with regards to airship pilot licensing and airship airworthiness certification. Moreover, airships remain largely in development, as most designs are still in the prototype phase. Given the significant benefits of operating airships in the Arctic, it is important to encourage the growth of the airship industry by establishing comprehensive airship regulations and CAF-sponsored airship projects and investments.

Captain (Capt) Catherine Cabot, an aerospace engineering officer, has worked in the CP140 community at 14 Software Engineering Squadron and 14 Air Maintenance Squadron in Greenwood as well as at the Project Management Office in Ottawa. She also deployed to Afghanistan where she worked at 440th Air Expeditionary Advisory Squadron, United States Air Force, as the Maintenance Operations Officer. Capt Cabot also holds a project-management professional accreditation and a post-baccalaureate certificate in aerospace programme management. Capt Cabot is currently serving as aide-de-camp to the Chief of the Defence Staff.

ABBREVIATIONS

CAF	Canadian Armed Forces
DND	Department of National Defence
DRDC	Defence Research and Development Canada
HAA	high altitude airship
HAV	hybrid air vehicle
JISR	joint intelligence, surveillance and reconnaissance
RPAS	remotely piloted aircraft system
SSE	*Strong, Secure, Engaged: Canada's Defence Policy*

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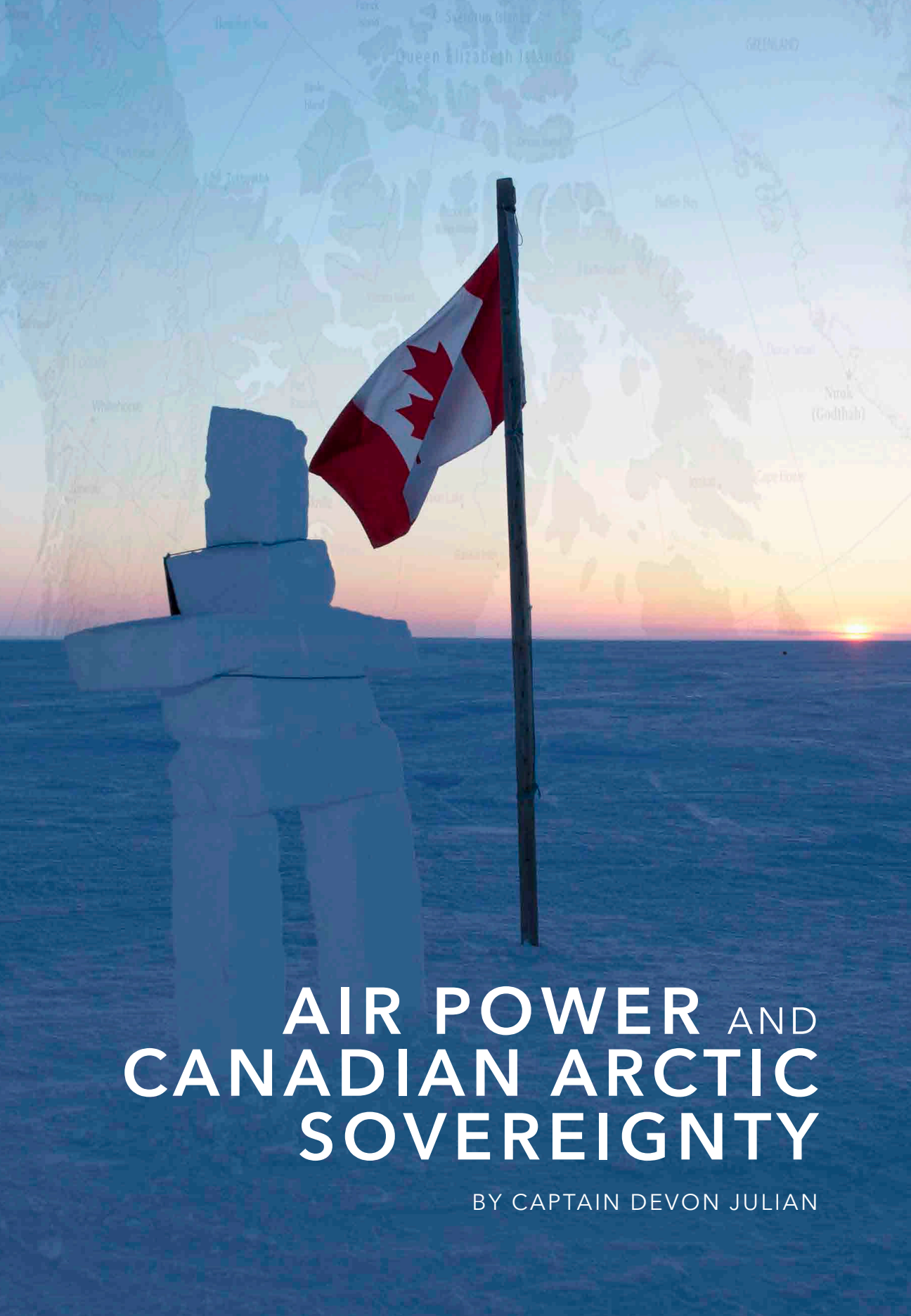

AIR POWER AND CANADIAN ARCTIC SOVEREIGNTY

BY CAPTAIN DEVON JULIAN

Editor's note: This paper was written by a candidate attending the Air and Space Power Operations Course in fulfilment of one of the requirements of the course of study.

The Arctic has become a prominent topic in government and military forums, both here in Canada as well as internationally among other Arctic nations and global powers. With climate change leading to increasing access to formerly unusable trade routes, and with large reserves of natural resources being discovered, interest in the Arctic is at an all-time high. This interest is forcing our national government and military leaders to consider how to establish and defend Canada's sovereignty in the North. The decisions on how to manage Arctic sovereignty in Canada are crucial because, "with 40% of our landmass in the territories, 162,000 kilometres of Arctic coastline and 25% of the global Arctic, Canada is undeniably an Arctic nation."[1]

With a land mass of this size—and a sparse population totalling less than 1% of the total Canadian population[2]—air power has become key in patrolling and defending the vast expanse of the Canadian Arctic. The government identified the relationship between air power and the Arctic, and it laid out numerous procurement initiatives in *Strong, Secure, Engaged: Canada's Defence Policy* (*SSE*). These include procurements specifically for applications in Arctic operations, such as space-based observation and communications equipment as well as medium-altitude remotely piloted aircraft systems (RPASs). They also include the replacement of the CP140, CC150, CC138 and CF188 platforms for broader use and specific Arctic missions.[3] While these projects are undoubtedly critical to defending Canada's North moving forward, in order to establish and maintain sovereignty in the Arctic, Canada must prioritize the development of physical infrastructure in the form of an Arctic hub over the acquisition of advanced platforms.

Arctic sovereignty and defence are not new topics in Canada, as the Arctic's current situation dates back to the late 1940s and early 50s with the emergence of the Soviet nuclear threat. This threat vaulted the Arctic into the forefront of strategic importance during the Cold War and led to Canada's first large-scale defence investment in the North: the joint Canadian-American Distant Early Warning (DEW) Line, a line of 63 radar installations stretching over 4,800 kilometres from Alaska to Greenland.[4] It was completed in 1957 in what would become the focal point of the North American Aerospace Defence Command (NORAD).

With this rapid increase in northern activity came concerns over Canada's sovereignty in the region; the great influx of American contractors and service members would change the Arctic's demographics. With Americans arriving in large numbers and taking over Canadian roles and responsibilities, the North became more American than Canadian in terms of presence[5] and, consequently, the perception of Canada's sovereignty in the Arctic was called into question.

But what is sovereignty with regards to the Arctic? Donald McRae of the University of Ottawa suggests that sovereignty is a "responsible government provid[ing] for proper policing, surveillance, search and rescue [SAR] and other services throughout its territory"[6]; this definition reveals the true benefits of the DEW Line's development. With the large airstrips built to accommodate the American heavy-lift aircraft ferrying supplies to the North, Canada gained access to the Arctic that was previously unimaginable. This greater access made the region easier to police and "allowed Canada to exercise a *degree* of physical control over its sovereignty that previously had not been possible."[7] [emphasis in original]

With the transition from the DEW Line to the more modern North Warning System, Canada moved to an unstaffed system of radar warning sites across the North[8] and lost much of the physical presence it had gained during the Cold War era. The number of personnel was reduced and, perhaps more importantly, the large airstrips were abandoned and access to the Arctic was severely diminished.

A CF188 Hornet fighter jet waits its turn to move onto the runway during Exercise VIGILANT SHIELD 16 in Iqaluit, Nunavut, October 22, 2015.

Now, Canada only has a meagre permanent defence presence in the high Arctic, including: two deep-water ports under construction in Iqaluit and Nanisivik; the Canadian Forces Arctic Training Centre in Resolute Bay; the high-Arctic weather and research stations at Eureka and Alert; and three airports, which are capable of acting as forward operating locations for the CF188 fleet.[9]

This is in stark contrast to the main threat in the region, Russia, which is currently reported to have "6 military bases, 16 deepwater ports, 13 airbases" and a plan for 13 SAR centres throughout the Russian Arctic region.[10] Furthermore, a senior Russian vice admiral stated that "every Arctic island where there are bases of the Northern Fleet is being outfitted with all-season airfields which will be able to host different types of aircraft including heavy transport planes and fighter jets."[11] While it is not practical to compare the military power and capability of Russia to that of the Canadian Armed Forces (CAF), it is worth noting the importance that Russia places on physical presence in the Arctic and on the operation of its full range of aviation assets in the North.

What Canada would gain by investing in even a single high-Arctic hub would be two-fold. First, it would serve to employ our current and future air power inventory more effectively, increasing both the reach and speed of all required Arctic capabilities. Secondly, it would enable an increased northern presence, thereby allowing a higher degree of control and reinforcing Canadian claims on Arctic sovereignty.

The ageing CF188, CC130HT and CC150T fleets in their northern defence and NORAD roles provide a case study on the increased effects that could be attained through a high-Arctic airfield and hub. Although the CF188 does currently operate from three forward operating locations in the Arctic, due to the extreme ranges it must fly from suitable airfields to accomplish its air defence role, it is heavily dependent on tankers to accomplish these missions.[12] Currently, the CF188 is only served by the CC130HT for northern sovereignty and NORAD missions, as the CC150T is tied to longer, paved runways and does not have a suitable airfield for operation in these high Arctic conditions.

With the CC130HT's retirement planned for 2020,[13] the CF188 fleet will be left without a viable Arctic tanker and will have limited abilities to respond to NORAD or northern sovereignty missions. However, by investing in an Arctic hub that could support CC150 Polaris tanker operations, Canada would retain its ability to defend the North. It would also increase the CF188's range and speed, with the Polaris delivering a cruise speed nearly double that of the Hercules, along with approximately 50% more fuel offloading and range.[14]

Another problem facing all personnel in the Arctic is that, by pushing the range from acceptable airports, they become disconnected from available SAR assets. The rescue efforts for the Boxtop 22 crash, Canada's largest and most challenging northern SAR operation, demonstrated a number of shortcomings in Canada's SAR programme at the time. One of these problems was the geographic challenge of SAR operations in the North, especially when combined with no permanent SAR assets based north of Winnipeg.

THE RESCUE EFFORTS FOR THE BOXTOP 22 CRASH, CANADA'S LARGEST AND MOST CHALLENGING NORTHERN SAR OPERATION, DEMONSTRATED A NUMBER OF SHORTCOMINGS IN CANADA'S SAR PROGRAMME AT THE TIME.

In 1991, when Boxtop 22—a CC130—crashed on approach into Canadian Forces Station (CFS) Alert, it took over 7 hours for the first aircraft to reach the crash site and over 32 hours before the first rescuers accessed the site.[15] Although CFS Alert is equipped with an airstrip suitable for the SAR CC130s, it was not equipped to support a major air disaster–type search and, as such, Canada had to rely on American facilities at Thule, Greenland, to support the search effort. To this day, all Operation BOXTOP resupply missions to CFS Alert operate out of Thule, meaning they also rely on American involvement in maintaining our Arctic footprint.[16] While this arrangement is effective, if Canada must rely on another Arctic nation—or two, in this case, as they are American facilities on Danish soil—to support its Arctic infrastructure, it loses some of its asserted sovereignty in the North.

Surveillance of the North works hand in hand with its active defence. The Canadian government has identified surveillance as one of the keys to Arctic sovereignty; surveillance is addressed in *SSE* through the acquisition of RPASs and space-based systems meant to integrate with current equipment and build a solid picture of all traffic moving through the Arctic areas.[17] Our current inventory of surveillance assets for use in the Arctic includes air power assets such as the CP140 Aurora—which, after its modernization programme, features world-class surface and subsurface tracking as well as intelligence, surveillance and reconnaissance (ISR) capabilities.

A CC177 Globemaster aircraft prepares to land at Thule Air Base, Greenland, after dropping off equipment at Canadian Forces Base Alert during Operation BOXTOP on September 30, 2016.

The Aurora has the ability to routinely fly 10–12 hour mission sets and, coupled with a high cruise speed, it can cover large areas with highly effective ISR. However, it is handicapped by the requirement to operate from paved runways and its standard basing on either of Canada's southern coasts.[18] If the Aurora could operate from a high-Arctic hub, its 4,000 nautical mile (NM) range would allow coverage from the Labrador Sea all the way to the Arctic Ocean, which would span the entire Northwest Passage in a single mission.[19] This ability would enable surveillance of the increasing maritime traffic through the Northwest Passage, while also allowing the CP140 to track and deter the threat of Russian and Chinese submarines.

Finally, the Arctic hub would provide a greater presence by streamlining resupply missions to Arctic stations such as Alert and Eureka. It would also provide the ability to have a more permanent population of forward deployed personnel for NORAD, northern sovereignty operations and SAR. Also, if a central location such as Resolute Bay was selected, it would be within the range of all CAF and Canadian Coast Guard helicopters for transporting supplies and personnel to the Nanisivik port, again streamlining resupply missions and creating more efficient Arctic operations.[20] Tony Balasevicius summarized this in his article for the *Canadian Military Journal*:

> Defence must develop a greater capacity to operate in the Arctic for extended periods. This can be done by acquiring the necessary infrastructure in key locations that can be used as either a hub or as temporary forward operating bases. Such a capability would allow the CF [Canadian Forces] to better deal with rapid response operations, including such matters as Search and Rescue. Moreover, it would allow the government to have better situational awareness, and to project key national elements anywhere within the Arctic region on very short notice.[21]

The development of an Arctic hub would not come without its challenges. Infrastructure projects in the North are more expensive and complex than the same developments in the South due to the large distances that materials need to cover, the small population and poor supporting infrastructure.[22] The severe weather creates problems with construction as well as facility maintenance, and climate change is beginning to place even greater strain on Arctic structures, adding significant costs to running and maintaining these facilities. While the Arctic hub would be a force multiplier and enabler for Royal Canadian Air Force (RCAF) assets operating in the North, it must be noted that severe weather could often temporarily reduce or even shut down operations. These factors could limit the hub's effectiveness during seasons of inclement weather.

With *SSE* in play, Canada is devoting greater funding to developing and acquiring new technologies to defend the Arctic and establish as well as maintain sovereignty. Such technologies will include modernized satellite systems for communication and surveillance; new fighters, tankers and ISR platforms that can operate in the Arctic; and RPASs for unmanned ISR capabilities.[23] These technological gains present an exciting step forward in equipping the CAF—and specifically the RCAF—to better watch and control the Arctic.

Of these capabilities, RPASs have drawn a great deal of attention, as their attributes of range combined with long loiter times deliver an effective package for patrolling and monitoring the Arctic's large expanse. The RCAF states that the advantage of these RPASs is primarily their ability to stay airborne longer than their manned counterparts. The RCAF also states that RPASs are not to be considered platform replacements, but platform complements working to improve the capability of aircraft such as the CP140 Aurora.[24] The RCAF is looking into purchasing the "medium-altitude, long-endurance" subset of RPASs, and it is hard to argue with the logic, given that new variants of the Predator B, for example, can endure up to 42 hours at speeds of up to 240 knots.[25] When combined with a modern sensor suite, this combination of speed and persistence will allow for impressive ISR

coverage of Arctic regions and, with the ability to be armed, it could be an option for defending the sparsely populated northern approaches.

SSE also describes the RPASs' ability to "remove humans from dangerous situations, and permit operations in severe and inhospitable environments."[26] These attributes lend themselves towards Arctic missions, wherein severe weather and long distances place crews in danger when operating far from available SAR assets; this weather also presents survival challenges if the aircraft were to go down. As previously discussed, this is a position that CF188 and CP140 crews routinely experience while patrolling and defending the far reaches of Canadian sovereign airspace.

Further complicating the survival aspect of northern aircrew operations is the replacement of the CC130H with the new CC295 platform. While the CC295 will provide greatly improved and advanced sensor capabilities, it will also present a reduction in range from 2,800 NM to 2,300 NM, as well as in speed from 300 knots to 260 knots, when compared to the legacy Hercules.[27] In the current operating posture, this will increase the aircrews' exposure to the hazards of Arctic flying for longer periods of time, making another case for the implementation of RPASs.

While RPASs will provide advanced sensing and loitering capabilities, they are not without their limitations for Arctic employment. They come with costs, and there is currently a shortage of the satellite communications required to operate RPASs. This is already well known in manned aircraft operations; however, as an RPAS requires these communications to operate, the shortage is a significant barrier to operating the RPAS throughout its full range of capabilities. While this issue may be solved through the planned upgrade to the RADARSAT system, it could present a significant time delay in getting an RPAS up and running. Severe weather—including strong winds, low temperatures and frequent icing conditions—could also pose problems with current RPAS operations.[28]

AS ROB HUEBERT POSITS, IF "CANADA HAD KNOWLEDGE OF [INCURSIONS INTO CANADIAN SOVEREIGN TERRITORY] BUT WAS UNABLE OR UNWILLING TO STOP THEM, IT WAS NOT ABLE TO ASSERT CONTROL."

Finally, RPASs require significant infrastructure to operate, such as ground control stations and hard-surfaced runways. In fact, a Predator drone requires the same runway infrastructure as the CP140 Aurora: a 5,000 foot paved surface for take-off and landing. Despite the long range and endurance of the RPAS, this requirement reduces the area the RPAS can service by introducing transit times from the limited number of acceptable airfields in the North. For these reasons, it has even been argued that Canada does not need an Arctic RPAS programme at all. Between the RADARSAT constellation, the northern radar line, the Aurora and Transport Canada assets, some say that Canada is already well equipped for Arctic surveillance, but needs to better use these assets to improve surveillance in the North.[29]

The Arctic hub, the RPAS and platform upgrades all have significant potential in establishing and maintaining Canada's Arctic sovereignty. The Arctic hub could provide an advantageous physical presence in the North. It can enhance existing capabilities in pursuit of increased Arctic surveillance and policing, while also enabling the support and projection of new capabilities as they come online. The Arctic hub would also support numerous other outposts and agencies, all of which are working towards Arctic security. These advantages are directly linked to the earlier definition of sovereignty as "a responsible government provid[ing] for proper policing, surveillance, search and rescue and other services throughout its territory."[30] All of these facets are improved by the adoption of a high-Arctic hub.

While RPASs and other advanced platforms will certainly have a place in Canada's Arctic sovereignty plan, they currently lack the physical presence and ability to reach out and actively control the Arctic. As Rob Huebert posits, if "Canada had knowledge of [incursions into Canadian sovereign territory] but was unable or unwilling to stop them, it was not able to assert control."[31] This is where the RPAS currently falls behind. While we need the ability to improve monitoring and surveillance, especially with increasing traffic as the Northwest Passage begins to open, we also need the ability to actively defend and police the area, which requires physical presence and infrastructure. Once the infrastructure is in place and supporting our assets, the new platforms can be implemented and used to their full capability.

To this end, while Canada has placed a great emphasis on the acquisition of RPASs for the Arctic, it must prioritize the development of an Arctic hub to establish and maintain its Arctic sovereignty over advanced platform purchases. Once established, the Arctic hub will increase the Canadian footprint in the North to support Canada's Arctic sovereignty claim; enable better control and policing; and, once new aircraft and RPASs are ready to be implemented, allow RPASs to be used to their full capacity and effectiveness while maximizing the efficiency of current fleets until they can be retired.

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ABBREVIATIONS

CAF	Canadian Armed Forces
DEW	Distant Early Warning
DND	Department of National Defence
ISR	intelligence, surveillance and reconnaissance
RCAF	Royal Canadian Air Force
RPAS	remotely piloted aircraft system
SSE	*Strong, Secure, Engaged: Canada's Defence Policy*

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ROYAL CANADIAN AIR FORCE SUCCESSION PLANNING:

CHOOSING THE RIGHT PEOPLE TO LEAD AIR POWER USING LESSONS LEARNED IN INDUSTRY

By Captain Colin Strong

Editor's note: This paper was written by a candidate attending the Air and Space Power Operations Course in fulfilment of one of the requirements of the course of study.

As outlined in B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine*, air power builds its foundation on a tenet of centralized control and decentralized execution, predicated on command and control structures staffed by capable and competent military leaders.[1] Putting the right people in the right place at the right time is crucial to filling Royal Canadian Air Force (RCAF) command and control positions. This process, in general terms, whether it be in industry or in a military organization, is most often referred to as "succession planning."[2]

Succession planning is an important part of any organization's long-term strategic planning, featuring prominently in both private- and public-sector management theory.[3] Yet research indicates that the military does not corner the market on all things strategy, with private-sector succession-planning practices generally considered to be more robust.[4] Although there are certainly military-specific aspects that govern succession planning in the RCAF, this article argues that these aspects do not preclude the RCAF from adopting civilian-industry succession-planning practices to improve the process' outcomes.

To support this argument, succession-planning practices found in both the private-sector and RCAF policy doctrine must be analysed and compared. For the purposes of this paper, specific succession-planning tools such as the Canadian Forces Personnel Appraisal System (CFPAS) or similar programmes internal to civilian industry will not be assessed. Succession-planning processes are deemed to govern the use and creation of succession-planning tools; thus, a comparison of processes alone allows for relevant conclusions to be formed. It should also be stated that, in industry, succession planning within a family business is considered to be distinctly different from succession planning within non-family-run organizations. This paper will therefore explore civilian-industry succession planning in the context of selecting from a pool internal or external to that organization, not limited by family relation, as this more closely resembles the process used by the RCAF and will generally allow for a more meaningful comparison.

To understand the military-specific aspects of RCAF succession planning, a review of Air Force succession-planning policy is required. The RCAF defines succession planning as the "appointment … of RCAF personnel to fill Command and key institutional positions that lead to the development of senior leaders for the RCAF and [Canadian Armed Forces (CAF)]."[5] In this definition we find the principal distinction between military and civilian succession planning, specifically the selection of individuals to hold positions of command.

Being selected to hold a position of command speaks to possessing leadership qualities beyond the usual strategic visioning and managerial skill sets demanded of senior business leaders. The RCAF defines command as "the authority vested in an individual of the armed forces for the direction, coordination, and control of military forces."[6] To expand further, a military commander has the authority, if authorized by the government, to knowingly issue orders that could lead to the injury or death of their subordinates, or may direct their subordinates to use force up to and including lethal force on an enemy.[7] This type of authority clearly goes well beyond the typical authority exercised by senior-executive business managers. Command responsibility demands great discretion and personal leadership ability, with the cost of getting things wrong potentially paid for in human lives. Consequently, the RCAF succession-planning process is charged with identifying the select and worthy few who have both the ability and the desire to hold such authority. Figure 1 gives a high-level introduction to the overall process used to manage RCAF officer progression.

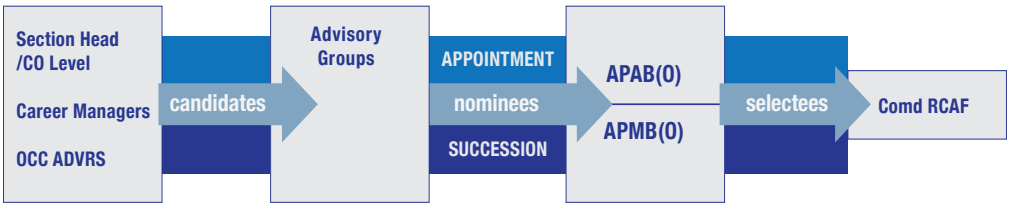

Figure 1. Air Force Personnel Management – Officers[8]

Depicted are two parallel processes used by the RCAF to develop high-potential candidates (succession) and to select which officers will fill key positions (appointment). The appointment process assigns individuals based on actual and planned vacancies, while the succession-management process is used to identify, monitor and mentor individuals throughout their careers to groom them for senior appointments in the RCAF and CAF.[9] This article focuses largely on the succession-management process.

The purpose of the succession-management process, otherwise known as succession planning, is to identify and promote officers with the potential and motivation to achieve the highest senior-officer command appointments, positions such as commander of an air division, Commander (Comd) of the RCAF or even Chief of the Defence Staff.[10] To ensure those identified have the ability to command well at such high levels, candidates are appointed to key development positions, such as commanding officers of units or bases, in order to cultivate experience and competence.[11] The appointment and succession processes are therefore linked to each other in a cycle of development through appointment, growing candidates for increasingly senior positions.

To feed this cycle, the entire officer-progression process is built on a bottom-up approach whereby unit, squadron or wing commanding officers recommend junior candidates to RCAF advisory groups. A key guiding principle in this process is that RCAF succession candidates are to be identified early in their careers and aggressively challenged, developed and mentored.[12] This is also an important principle adopted in industry and in other militaries.[13] Selection of succession candidates early in their careers allows organizations to provide opportunities to develop competencies in time to fill senior roles.[14] This is especially important in the RCAF, as the Air Force does not directly hire external (i.e., civilian) talent to fill its command positions.[15] Talent must be grown internally and on a timeline that often spans decades.[16] To develop high-potential officer talent over such a long timeline, officers are given access to professional-military-education resources, such as command and staff courses, and are assigned to a breadth of command and staff positions usually unrelated to their entry-trade speciality (e.g., pilot, engineering, finance). This results in developing generalist officers who have seen as much of the RCAF as possible in order to create a well-rounded view of the entire organization before assuming command at the highest levels.[17]

Each CAG assessment is largely made in isolation of the others and by officers who are themselves in the succession pipeline.

The process of early succession-candidate selection relies heavily on the work of various internal advisory groups, such as the capability advisory groups (CAGs). The CAGs represent individual RCAF sub-communities, each largely defined by aircraft fleet or employment type. The CAGs are responsible for advising on succession planning at ranks of lieutenant-colonel and below, and are consequently in control of feeding the entire RCAF "leadership pipeline."[18] The use of the CAGs in this way allows for significant mid-level organizational influence over the future leadership of the RCAF and CAF. This is somewhat unique to military organizations like the RCAF, as a performance metric–based approach governed at the most senior chief-executive level is often favoured in industry.[19]

It becomes clear why this model was chosen, however, when one considers that RCAF succession planning is largely based on assessing qualitative personal traits to fill key command positions.[20] Though they surely would like to, senior RCAF commanders will likely never work with, meet or be able to qualitatively assess junior succession candidates directly. With the absence

of quantitative performance measures, the RCAF uses officers already in command positions much closer to the candidates to assess them subjectively, with senior leaders relying on the chain of trust, or chain of command, to validate each assessment and build a list of high-potential officers.[21]

Through its advisory groups, the RCAF has built its succession-planning process to follow the mid-level (operational and tactical) employment and command advisory structure of the Air Force.[22] This is different from industry, which tends to favour using human-resource or talent-management models that are governed closely at the executive-management level and permeate across all organizational areas equally, applying a consistent standard of assessment.[23] In industry, parallel human-resource reporting chains may also be used to help eliminate biases.[24]

A detailed explanation is not given as to why the current model was chosen for the RCAF,[25] though it seems to be a natural solution to governing an organization with many key command positions separated by vast Canadian geography while also catering to the many distinct roles played by each capability group within the Air Force. Given CAG members' proximity to the main body of junior RCAF officers as well as their own experience in command positions (CAGs are largely comprised of commanding officers), this is a logical process to use when seeking to identify all junior RCAF officers with command-leadership ability. It must be noted that, while this construct allows for assessment of succession candidates across the entire RCAF, each CAG assessment is largely made in isolation of the others and by officers who are themselves in the succession pipeline.[26] This demands some form of strategic-level governance by leaders who also have command experience as well as a better view of the needs of the RCAF. This is the role filled by the RCAF's air personnel boards.

RCAF SUCCESSION PLANNING MAKES GOOD USE OF THE EXPERIENCE INTERNAL TO THE RCAF IN ORDER TO IDENTIFY, DEVELOP AND ASSESS CANDIDATES IN TIME TO FILL SENIOR LEADERSHIP ROLES.

The air personnel boards help the Commander of the RCAF make decisions on which officers to put into key positions (command and staff) and to develop a medium- to long-term succession plan.[27] There are two boards: the Air Personnel Appointment Board (Officers) and the Air Personnel Management Board (Officers). Both boards make their deliberations based on the recommendations of the advisory groups, as shown earlier in Figure 1.

The appointment board is tasked to recommend who will fill specific key command and staff positions and the management board recommends members for official tracking as a succession-planned candidate. The management board's membership includes all available RCAF major-generals and brigadier-generals, along with other internal-to-RCAF career-management advisors.[28] This is a rational construct when one considers the primacy command holds as the most prestigious of military employment types. Considering all general officers will complete a command tour during their career, it is natural to assume that they are well positioned to assess the distinct set of competencies demanded of officers who are asked to assume positions of command.[29]

As a whole, when considering the unique nature of command, RCAF succession planning makes good use of the experience internal to the RCAF in order to identify, develop and assess candidates in time to fill senior leadership roles. For an organization that requires not just managers but commanders, the RCAF looks internally to find its future leaders and has consequently developed a robust and logical succession-planning process to meet that need.

Succession planning in industry is similarly defined in terms of identifying candidates and appointing leaders; however, compared to the RCAF there are some key differences, namely: access to external talent to fill top executive positions[30] and availability of quantitative data (e.g., company

financial records) to assess executive historical performance.[31] Despite these differences, a major similarity is found in the "generalist approach" to succession planning. As is the case within the RCAF, high-potential business leaders are expected to prepare for senior-executive roles by building experience through a varied portfolio of management positions.[32] Research shows that within industry there is a prevailing opinion that high-performance business leaders will be successful anywhere. This opinion is not rooted in data, and as one journal puts it:

> No one expects a great football player also to excel at cricket, or assumes that an accomplished concert violinist could achieve the same level of virtuosity playing piano. Yet, when it comes to leadership, the idea that there are "athletes" who can excel across all situations and business challenges persists.[33]

Despite ample literature supporting the importance of succession plans, formal succession planning is not prevalent in industry, with less than half of organizations reporting that they have a formal process.[34] This lack of process persists even though research shows that companies with formalized succession plans benefit from having increased numbers of succession candidates to choose from and select a permanent replacement in shorter time.[35] Moreover, in industry the financial cost of getting succession planning wrong can be enormous. One report indicates that appointing the wrong chief executive officer (CEO), typically the most senior leader in business, can cost more than $100 billion in lost performance for a major, global company.[36]

A BOARD PROVIDES A MORE WHOLESALE REVIEW OF THE COMPANY'S SITUATION AND WILL MAKE A MORE OBJECTIVE DECISION WHEN CHOOSING THE CEO'S SUCCESSOR.

There are generally four approaches companies use in CEO succession planning: the "CEO-in-Waiting" approach, where the successor is promoted to a position just below the current CEO; "Internal Development," where the company identifies high-potential candidates and develops them individually; "External Recruit," where the company looks to hire an executive with proven talent elsewhere; and the "Inside-Outside Approach," where the company compares internal candidates against external files and selects the most qualified.[37] In nearly all cases, a company will use an executive or corporate governance board to perform the bulk of executive succession-plan decision making.[38]

The concept of a corporate board differs from boards within the RCAF in that the corporate board—consisting of key stakeholders, investors and advisors—is largely divorced from the day-to-day running of the company. As a group, the corporate board is charged with the long-term strategic planning for a company, which includes succession planning.[39] Though the board may include or involve the CEO, the CEO and their "C-Suite" (chief finance officer, chief operations officer, etc.) are primarily tasked with optimizing the management and performance output of the company.[40] This contrasts quite sharply with the RCAF's advisory group and air personnel board construct, which is a decision-making loop internal to the RCAF with little oversight from external strategic-level defence or ministerial agencies governing the CAF.

In industry, the reason for using a board to select CEO successors is simple: the board is responsible for future performance and strategy, while the outgoing CEO has a vested interest in the current strategy and in its continuance.[41] A board provides a more wholesale review of the company's situation and will make a more objective decision when choosing the CEO's successor.[42] However, boards are often poor at evaluating CEO talent, thus they must be supported with a mix of deep experience in CEO selection as well as a robust talent development and assessment programme within the company supported at all levels.[43]

When planning succession in industry, proper alignment of individual capabilities, style and expertise with the needs of the organization consistently produces the best succession plan results.[44] Like the RCAF, industry seeks to develop talent from within its own organizations whenever possible, with one study showing only 17 percent of companies prefer to look exterior to their organization to fill key positions.[45] However, companies go even further than just looking at internal candidate competency.

Significant attention is paid to internal company factors (strategic goals, culture, current company performance, etc.) that provide context to managerial and leadership skills; this matters significantly when evaluating the performance of the individual and allows for much better matching of candidates to positions.[46] When 20 former General Electric executives were named as CEOs at other companies, some of those companies outperformed their peers by as much as 70 percent, while others underperformed by 30.[47] The difference in these results was accounted for by the degree to which the CEOs' skills matched the requirements of the new positions; in other words, how much a CEO matched the position and the company mattered more than how well they performed on their own.[48]

This indicates that understanding the specific requirements of key positions in addition to establishing a good inventory of succession-planned-candidate skill sets is crucial for high-performance succession plans. To achieve optimal succession-planning outcomes, executive boards must produce a profile of qualities and competencies to match against candidate qualities.[49] Simply hiring a well-rounded, capable candidate is not enough.

When Donald Rumsfeld assumed control of the United States Department of Defense (DoD) as Secretary of Defense from 2001–2006, he brought with him significant experience in both public- and private-sector management.[50] Rumsfeld understood that the military was a "closed system," in that leaders at the top were members who had entered service some 30 years earlier, and the organization would not allow lateral injects of leadership at the top.[51] Perhaps Rumsfeld even understood that, when compared, those CEOs generated internally versus CEOs recruited external to a company perform about the same, with the health and competitive position of the company at the time of the succession acting as better indicators of company performance post succession.[52] What mattered most was correctly assessing the organization's needs and the candidate's abilities.

WHAT MATTERED MOST WAS CORRECTLY ASSESSING THE ORGANIZATION'S NEEDS AND THE CANDIDATE'S ABILITIES.

Under Rumsfeld, the DoD succession model changed its locus of influence for succession planning away from the DoD military services (i.e., commanders, as in the current RCAF model) and moved it to key military and civilian advisors, in consult with the Secretary of Defense directly.[53] In essence, Rumsfeld replicated what most would consider an executive governance board that was fully integrated into all levels of the defence-establishment succession process.[54]

Under the Rumsfeld model, succession planning looked at identifying candidates to fill the top military positions in all service branches three to five years out, sometimes two to three changes in the future.[55] In industry, organizations that groom an heir apparent well in advance of the current CEO departing address a key risk area during succession events: namely, the transition period between two senior leaders. Companies using a concept called "relay succession" (i.e., having new CEOs identified in advance) have been shown to reduce their market volatility, improve accounting performance and have higher long-term stock market performance than firms that do not.[56] While there are no clear direct comparisons between market performance and military organizational performance, the principle of reducing volatility may be applicable to the RCAF and is worth considering.

To enable planning for long-term succession, the Rumsfeld model identified six key programme elements: focusing on key positions only; identifying position-specific competency requirements and qualifications; identifying and assessing high-potential candidates; matching pools of candidates and positions with respect to both near- and long-term successions; using career paths to deepen and widen candidate pools; and engaging senior executives in the process.[57] While the RCAF clearly incorporates most of these elements, identifying position-specific competency requirements and qualifications and engaging senior executives (i.e., external to RCAF) are noticeably lacking. Perhaps most interestingly, Rumsfeld acknowledged that a robust process is necessary to overcome the tendency to pick candidates that are well known and liked over those who may be better suited but lesser known, an idea shared by critics of RCAF succession planning.[58]

Ultimately, Rumsfeld changed the DoD succession-planning process from a linear model to a central committee model chaired by service executives (military and civilian) and supported by special assistants (civilian), fed by the service and joint chiefs of staff (generals)—this promoted longevity in decision making, retaining corporate knowledge, which may be lost if the decision were left to generals who would in turn depart in a few years themselves.[59] After his departure in 2006, the Rumsfeld process was mostly returned to the previous linear model controlled by service chiefs. Senior military leaders felt that under Rumsfeld's plan there was a lack of transparency in personnel-committee decision making, confusion with respect to the role of civilian special assistants and discomfort with the long-term identification of future leadership more than one rotation away.[60]

While the RCAF, when compared to industry, may have some rather unique succession-management requirements, there are certainly considerable similarities in terms of human-resource management as well as management of extensive financial and infrastructure resources.[61] While commanders may be required to exercise their command authority briefly from time to time, the day-to-day running of the Air Force demands skill sets that are patently managerial and strategic, the same as those needed for industry executives and CEOs.[62]

Under the current RCAF succession process, these skill sets may be lacking. Short periods of time are spent in each position and professional military education is relied upon to bridge any management gaps.[63] The RCAF openly acknowledges that there is a risk in moving officers frequently to produce generalist experience, created by not permitting officers to spend extensive time in key developmental positions.[64] One way to mitigate this risk is the continued funding of officer professional development and military education. Indeed, in industry there is also a strong correlation between funding of company learning and professional-development programmes to positive succession-planning-programme outcomes.[65]

Succession planning in its current generalist model also appears to have a negative motivational effect on RCAF senior officers.[66] Air Force Order (AFO) 1000-7 Air Force Personnel Management – Officers currently permits 15 percent of each RCAF officer trade to be succession planned,[67] resulting in many more officers than positions being identified.[68] Very few officers who are succession planned actually are promoted from lieutenant-colonel to colonel. As an example, only 22 percent of succession-planned air combat system operator lieutenant-colonels are promoted to colonel.[69]

Alternatively, moving away from the generalist succession-plan approach requires some significant reworking of RCAF succession policy. To produce an efficient, tailored succession-management system, a thorough understanding of succession candidates' competencies (both strong and weak) is required. By one estimate there are 27 competencies that RCAF CAGs are asked to assess formally and informally, with no apparent method to confirm how or if this is actually being done.[70]

Within the RCAF's succession planning order, Air Force Order (AFO) 1000-7, there are no rating scales or assessment methodology provided.[71] This is problematic, as AFO 1000-7 is considerably vague, and when put into practice leads to "considerable differences in methodology, approaches and transparency between various [advisory groups] with respect to selection, assessment, and continuous validation of [high-potential officers]."[72] The RCAF succession process also lacks clarity in terms of how much succession candidates should be engaged by their succession managers and in what ways.[73] In these respects it seems clear that the RCAF would benefit from better defining candidate-assessment processes in order to properly identify and assess its internal talent.

IT SEEMS CLEAR THAT THE RCAF WOULD BENEFIT FROM BETTER DEFINING CANDIDATE-ASSESSMENT PROCESSES IN ORDER TO PROPERLY IDENTIFY AND ASSESS ITS INTERNAL TALENT.

A guiding principle in effective industry succession planning is that processes must be clearly defined and there must be alignment at all levels of the organization in how they are implemented.[74] To accomplish this, a framework must be built that involves the identification of key positions and the determination of the key competencies required for them.[75] In the RCAF, a high-potential officer should have their skills and competencies mapped, then be put into positions tailored to help overcome weaknesses—always with a view to the future positions they are being groomed for.[76]

Based on human-capital and social-capital theories, an effective succession-planning framework includes the establishment of a dedicated internal-management system that creates a "leadership pipeline" by developing strategies to identify candidates and to assess executive experience.[77] In industry, this talent-management system is tied to measurement of the company's performance and can be adjusted by senior leadership to align with the strategic vision of the company based on company performance feedback.[78] While the RCAF does not have ready access to this type of quantitative feedback, it should still establish a clear path of control for strategic visioning to influence which candidates are identified and developed.

Currently, the leadership pipeline is initially filled by candidates identified at the operational and tactical levels by their CAGs. This level is beyond the immediate reach of RCAF strategic vision; therefore, it seems crucial that RCAF leadership puts in place a system that allows it to guide the entire process starting with initial candidate selection. This means identifying the competencies needed for specific senior positions and empowering the CAGs to profile the competencies of their officers, followed by creating individual development plans tailored to each individual.[79] Improvements in human resource–management technologies could also be leveraged to enable this process.[80]

After reviewing succession-planning practices used by the RCAF as well as in industry, it is apparent that Canada's Air Force has room to improve. Although there are certainly military-specific aspects that govern succession planning in the RCAF (e.g., the role of command), these aspects do not preclude the RCAF from adopting practices used in civilian industry. Indeed, suggestions for improvements made by serving RCAF officers Carlson, Chaloux and Setter[81] are aligned with literature discussing best practices used in industry. Furthermore, an examination of the United States DoD succession-planning model concludes that our allies have taken great advantage of best practices used in industry, applying them to their own military-succession-planning process.

Finally, it must be noted that, although improvements can be made to the efficiency and effectiveness of the RCAF's succession-planning process, the current process already has its strengths. Considering those plans developed in industry, the RCAF has a well-documented, formal succession-planning process that caters to the identification and development of its leadership and,

more importantly, to its future commanders. Though it achieves this in a relatively inefficient manner through generalist officer development, there was no indication in any literature reviewed for this article that the current RCAF process is failing to deliver on its primary purpose: to put strong leaders in command of air power.

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ABBREVIATIONS

AFO	Air Force Order
APAB(O)	Air Personnel Appointment Board (Officers)
APMB(O)	Air Personnel Management Board (Officers)
CAF	Canadian Armed Forces
CAG	capability advisory group
CO	commanding officer
comd	commander
OCC ADVR	occupation advisor

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72. Chaloux, "RCAF Succession Management," 6–7.

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74. Hauswirth, "CEO Selection," 2.

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78. LeCounte, Prieto and Phipps, "CEO Succession Planning," 51–52.

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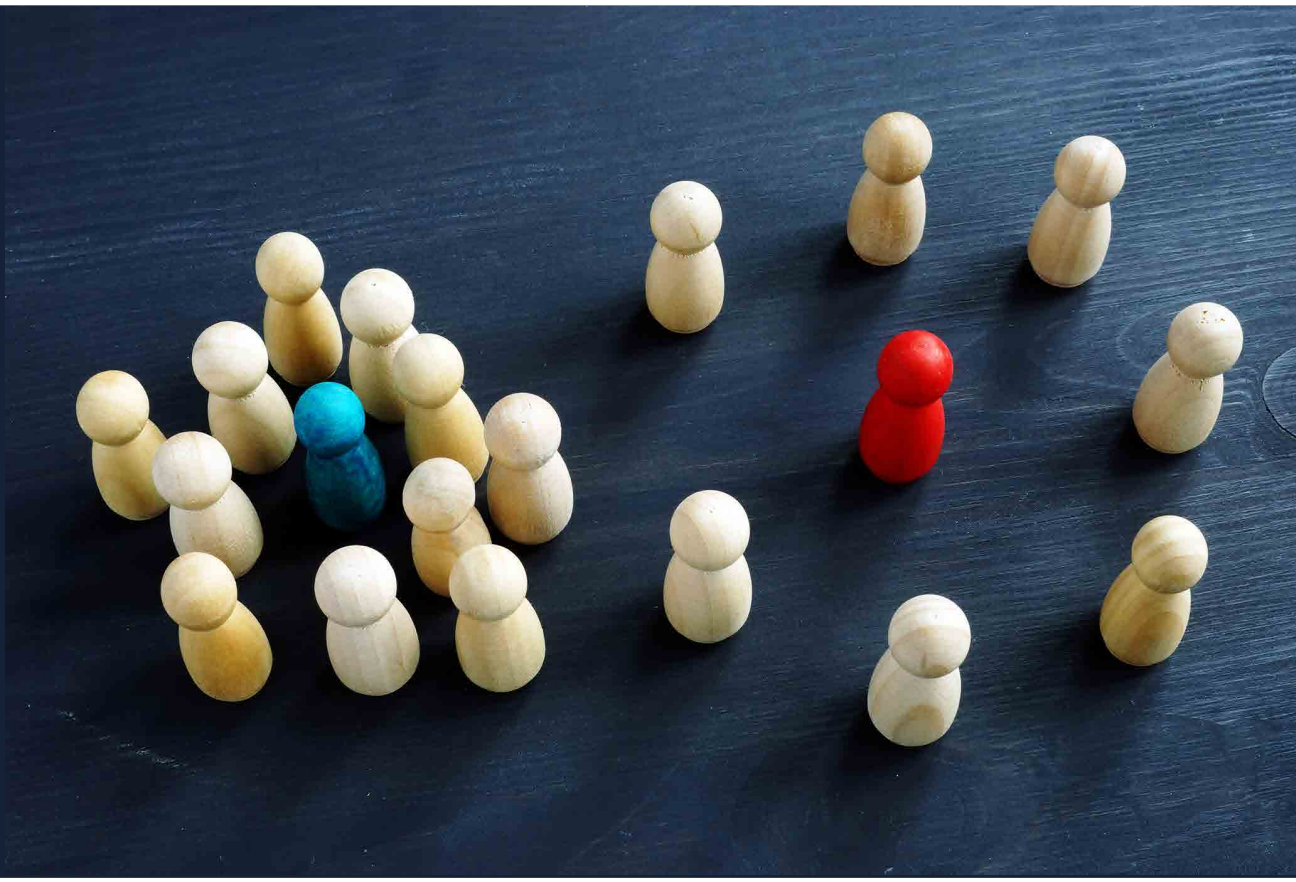
Personality Traits:



Is the RCAF Getting the Most Out of Its Members?

By Captain Erika Black

INTRODUCTION

"Depending on which study you consult, one third to one half of Americans are introverts—in other words, one out of every two or three people you know."[1] If these statistics surprise you, Susan Cain, the author of *Quiet: The Power of Introverts in a World That Can't Stop Talking,* explains "that's probably because so many people pretend to be extroverts" instead of embracing their serious and often quiet and reflective style.[2] The use of an extroverted persona is understandable, given the tendency for our society to misunderstand and undervalue introverted traits and capabilities. Unfortunately, this tendency results in a colossal waste of talent, energy and happiness.

Introverts are judged against a standard that privileges sociability, charisma and confidence, among other extroverted characteristics. For instance, studies show extroverted leaders are perceived to be more effective than their introverted counterparts, despite extroversion having no correlation to performance outcomes.[3] These findings suggest that extroverted employees are more likely to emerge as leaders in selection and promotion decisions because they are perceived as more effective by supervisors and subordinates.

However, the performance of leaders largely depends on the personality preferences of their staff. When managing proactive employees, for example, studies show that introverted leadership is actually more effective than extroverted.[4] Therefore, organizations that overlook the strengths of introverted leaders may be missing out on the potential for effective management. However, the bias for extroversion is not limited to the selections of leaders; it also extends to the work environment, where open-plan offices and group work are dominant features. These conditions are best suited to extroverts, whose work performance is unaffected by background noise and who thrive on and often dominate social interactions.[5] This is not the case for introverts, whose performance systematically decreases under these conditions, meaning many organizations may be impeding the power and potential of up to 50% of their workforce. In a climate where innovation and productivity are key to staying ahead of the competition (or, in a military context, the enemy), organizations can no longer afford to turn a blind eye to the needs and advantages of their introverted members.

Like society at large, the Royal Canadian Air Force is undervaluing its introverted members.

The article aims to demonstrate that, like society at large, the Royal Canadian Air Force (RCAF) is undervaluing its introverted members. This article will examine the differences between extroversion and introversion, perceptions of effective leadership and the influence of the work environment on the effectiveness of introverted members. Within each of these sections, recommendations are provided for consideration towards getting the most out the RCAF's workforce. Ultimately, this article seeks to convince the reader that, when it comes to introversion, difference in no way implies inferiority.

EXTROVERSION AND INTROVERSION

Psychologist C. G. Jung coined the terms "extroversion" and "introversion" in 1921 to describe the attitudes people use to direct their energy. According to Jung, extroverts are "outward-turning," or preferring to direct their energy to the outer world of people and activities; introverts are described as "turning inward," preferring to direct their energy to the inner world of thoughts and feelings.[6] However, there is no all-purpose definition for these terms.[7]

Generally, extroversion is characterized by outgoing, sociable, enthusiastic and assertive behaviours. "Extroverts are the people that will add life to your dinner party and laugh generously at your jokes."[8] They gain their energy from being around people. Introversion, in contrast, tends to manifest as serious, reflective and quiet behaviours. "Introverts…may have strong social skills and enjoy parties and business meetings, but after a while wish they were home in their pajamas. They prefer to devote their social energies to close friends, colleagues and family."[9] Introverts gain their energy from being alone. At work, "extroverts tend to tackle assignments quickly. They make fast (sometimes rash) decisions, and are comfortable multitasking and risk-taking. They enjoy 'the thrill of the chase' for rewards like money and status."[10] Introverts, on the other hand, work more slowly and deliberately. "They like to focus on one task at a time and can have mighty powers of concentration. They're relatively immune to the lures of wealth and fame."[11]

Extrovert and introvert traits can also be perceived as negative. "Extroverts can be perceived as arrogant, bossy, and self-centred," while "introverts can be perceived as shy, indecisive, slow, and lacking in social skills."[12] This opinion is supported by a study on the relationship between extroversion and sales performance: "Ambiverts [i.e., those who fall into the middle range of the extrovert-introvert spectrum] achieve greater sales productivity than extroverts or introverts do."[13] The researcher explains that this is because extreme extroverts may be overly assertive and enthusiastic, "expressing so much excitement for their own ideas that they may inadvertently suppress or neglect others' perspectives."[14] In addition, extreme introverts may not have "the requisite levels of enthusiasm and assertiveness to stimulate customer interest in products and services and convert this interest into sales."[15]

Various studies have shown that extroverted leaders are perceived as more effective than their introverted counterparts, despite extroversion having no correlation to performance outcomes.

PERCEPTION OF EFFECTIVE LEADERSHIP

With these descriptions of introverted and extroverted traits, one can see how having a variety of skills and abilities is necessary to positively contribute to organizational processes. However, as mentioned, various studies have shown that extroverted leaders are perceived as more effective than their introverted counterparts, despite extroversion having no correlation to performance outcomes. For instance, one meta-analysis on the relationship between personality and leadership shows extroversion as the most consistent correlation of leadership emergence and effectiveness across business, military and student settings. Leadership emergence refers to "whether (or to what degree) an individual is viewed as a leader by others, who typically have only limited information about the individual's performance. In contrast to being perceived as a leader, leadership effectiveness refers to a leader's performance in influencing and guiding activities of his or her unit toward achievement of its goals."[16] The study also confirmed that extroversion was more strongly related to leader emergence than leader effectiveness. These findings suggest that extroverted employees are more likely to be chosen as leaders in selection and promotion decisions as a result of being perceived as effective by both supervisors and subordinates.[17]

A similar study examined the relationship between strategic charismatic leadership and organizational performance, with primary data taken from a sample of 128 chief executive officers

(CEOs) of major United States (US) corporations. The study aimed to determine whether a CEO's charisma mattered. It assessed 770 surveys from top-management-team members, objective stock-market and accounting data as well as an objective measurement of environmental uncertainties (i.e., unstable, risky or crisis situations). The results showed that "CEOs who are perceived to be more charismatic appear to be perceived as more effective."[18] However, perceptions of CEO charisma were not associated with subsequent organizational performance. These findings mean that the preference for charisma "may be based more on implicit theory or halo effects [i.e., cognitive bias] than on solid evidence that charisma really does make CEOs more effective."[19] Organizations should therefore be cautious against putting too much weight on the potential benefits of charismatic leaders during selection or promotion decisions.

To further examine the relationship between personalities and organizational effectiveness, a more recent study tested the hypothesis that "the performance of extroverted leaders largely depended on the personality preference of their staff."[20] More specifically, it was predicted that "extroverted leadership enhances group performance when employees are passive [but] this effect reverses when their employees are proactive."[21] The study consisted of two experiments: one field test and one lab test. The field test assessed employee performance at 130 franchises of a US pizza delivery company: "In stores where employees weren't very proactive, extroverted leadership was associated with 16% higher profits than average—but in franchises where workers offered ideas, extroverted leadership was associated with 14% lower profits."[22] In the lab test, 163 college students were split into groups and asked to fold as many T-shirts as possible in 10 minutes; each group was given a designated leader. The results showed that the "groups with proactive followers performed better under an introverted leader—folding, on average, 28% more T-shirts."[23] These results are staggering.

The researchers explained that, in both experiments, the "extroverted leaders appeared threatened by and unreceptive to proactive employees," whereas the introverted leaders "listened carefully and made their employees feel valued, motivating them to work hard."[24] These findings

have significant implications, considering "proactive employees who take advantage of opportunities in a fast-moving, 24/7 business environment, without waiting for a leader to tell them what to do, are increasingly vital to organizational success."[25] Accordingly, any notion that introversion is a barrier to leadership should be reexamined.

According to Jim Collins, author of *Good to Great: Why Some Companies Make the Leap… and Others Don't*, many of the best performing companies he studied were not led by extroverted leaders, but by people he labelled as "Level 5 leaders." Collins says that "people generally assume that transforming companies from good to great requires larger-than-life leaders [with] big personalities."[26] However, his research proved this assumption wrong. Over a five-year period, Collins examined 11 companies that made the leap from good to great and were able to sustain their great performance. His aim was to determine how these companies outperformed their competition.

In trying to answer this question, Collins initially downplayed the role of the executives so he would not "slip into the simplistic 'credit the leader' or 'blame the leader' thinking that is so common today."[27] However, he soon realized there was something consistently unusual about these top executives. Collins states that the "executives from companies that went from good to great and sustained that performance for 15 years or more were all cut from the same cloth—one remarkably different from that which produced executives at the comparison companies in our study [i.e., the companies that didn't make the good-to-great list]."[28] He explained that these executives possessed a paradoxical combination of traits: they were "modest and wilful, shy and fearless."[29] They had the yin of personal humility and the yang of fierce, professional will, characteristics which Collins grouped as "Level 5 traits."

Importantly, he also noticed that "Level 5 leaders want to see their companies become even more successful in the next generation, comfortable with the idea that most people won't even know that the roots of that success trace back to them."[30] Collins acknowledges that great leadership "isn't the only requirement for transforming a good company into a great one—other factors include getting the right people on the bus (and the wrong people off the bus) and creating a culture of discipline."[31] However, his research shows that great leadership is one of the essential criteria for good-to-great transformations.

The aforementioned studies show that inspiring charisma and larger-than-life personalities are not the keys to transforming organizations from good to great. Accordingly, the RCAF should examine the extent to which similar perceptions exist within its organization, especially within selection and promotion processes. When selecting a leader, one should consider how a particular personality preference might work with subordinates. For instance, where creativity and efficiency are a priority, introverted leaders may get the most out of proactive employees. Ultimately, the RCAF should ensure it has the capacity to tap into the benefits of both extroverted and introverted traits to effectively lead the organization.

However, if leaders are to maximize employee contributions, they need to develop a thorough understanding of their employees. A fast route to achieving this goal is to first get employees to understand themselves. Luckily, personality assessment tools such as the MyersBriggs Type Indicator (MBTI) are available to assist. The MBTI "is an introspective self-report questionnaire with the purpose of indicating differing psychological preferences in how people perceive the world around them and make decisions."[32] The RCAF should consider implementing the MBTI or a similar personality assessment tool to fast-track the understanding of individual differences and how to best use those differences to achieve organizational success. The assessment's results could then be marked on the Member Personnel Record Résumé for that member's reference and supervisor

awareness. Members can use this information for professional development to strengthen their abilities and build capabilities in their weaker areas. An effective supervisor would adapt their communication or work style accordingly to productively work with their members. Moreover, this information could be used for work assignment and posting considerations. Such awareness and flexibility would undoubtedly contribute to the organization's overall success.

WORK ENVIRONMENT – THE OFFICE

RCAF leaders should accommodate their introverted employees' need for less stimulation by allowing employees to work from home and offering noise-cancelling technology.

In addition to being aware of employee preferences, it is important to understand the context in which they are employed. Consequently, it is necessary to further discuss the difference between extroverted and introverted employees as it pertains to their reactions to the outside environment. While there is not an all-purpose definition for extroversion and introversion, psychologists tend to agree on the different levels of outside stimulation extroverts and introverts need to function well—specifically that introverts function best with less stimulation whereas extroverts function best with high levels of stimulation.[33] This opinion is supported by research into the effects of background music and noise on the cognitive-test performance of introverts and extroverts. In this study, researchers predicted that introverts would not perform as well as extroverts in the presence of music and noise, but that, in silence, the performance of both personalities would be the same. The study's results confirmed this hypothesis: Introverts' performance in silence was better than performance in conditions of simulated office noise. Conversely, when the same tests were taken in the presence of noise, there was a strong relationship between performance and extroversion.[34] In other words, under noisy conditions, the performance of extroverts was essentially unaffected, but an increase in introversion was associated with a systematic decrease in test performance.[35]

Unfortunately for introverts, the presence of background noise has become a workplace norm since the open-plan office is the dominant choice by employers, primarily for economic reasons: "Fewer interior walls (and enclosed offices) permit larger floor plans to be achieved, which allow greater numbers of employees to be accommodated. Increasing the density of workers housed within an office space through open-plan configurations has consequently become an important method through which organizations attempt to reduce overheads."[36] However, findings on the effects of background noise show that the open-plan office poses considerable risks to organizational success. Namely, it negatively affects cognitive processes as well as task performance, and may contribute to stress for introverts.

These findings have significant implications for organizations like the RCAF which have open-plan offices in many units, meaning the RCAF is likely impeding the power and potential of up to 50% of its workforce. This issue may be partly addressed by the Government of Canada initiative to implement "Workplace 2.0" at all office accommodation projects and tenant services projects managed by Public Services and Procurement Canada.[37] In short, Workplace 2.0 aims to empower employees to choose where and how they work, encouraging productivity and providing them with more flexible technology and a greater variety of spaces. It appears that Workplace 2.0 strives to better balance the stimulation needs of extroverts and introverts by offering spaces for collaboration and/or socialization as well as a few quiet rooms when solitary work is required. However, Workplace 2.0 is

principally an open-plan office. Therefore, the productivity of introverted employees will continue to be impeded most of the time. To mitigate this issue, RCAF leaders should accommodate their introverted employees' need for less stimulation by allowing employees to work from home and offering noise-cancelling technology.

WORK ENVIRONMENT – GROUP WORK

The extrovert's preference for high levels of stimulation is favoured not only in workspace design, but also in how we structure group work. Enter the brainstorming group phenomenon. Alex Osborn, a Madison Avenue advertising executive, developed the concept of a "brainstorming" group in the 1950s.[38] It was originally intended for creating advertising campaigns, but is often used today for general problem solving. The process "involves recording ideas as fast as they can be generated, then evaluating those ideas at a later time for usefulness. The purpose of deferred judgement is to encourage people to propose bold, unique ideas without worrying about negative judgement from the group."[39] Ultimately, Osborn believed that people could think up more ideas when working in a group compared to working alone.[40]

However, subsequent research has shown that "brainstorming groups actually produce fewer and poorer quality ideas than the same number of individuals working alone."[41] Adrian Furnham, an organizational psychologist, determined this through years of research. In one study, Furnham discusses the results of the first study done in 1958 to reject the claim that brainstorming was effective. The results of that study showed that "'nominal' groups—made up of subjects who 'brainstormed alone' and then had their non-redundant ideas combined—outperformed 'real' groups—people brainstorming together in the same room."[42] According to Furnham, these results have been consistently replicated. Other studies show that brainstorming performance gets worse as the group's size increases: "Groups of nine generate fewer and poorer ideas compared to groups of six, which do worse than groups of four."[43]

Researchers have pointed to three processes that reduce the effectiveness of brainstorming groups (or real groups):[44]

1. "social loafing: the group context enables individuals to make less effort";
2. "evaluation apprehension: fear of suggesting ideas which might make one look foolish"; and
3. "production blocking: only one member can speak at a given time, therefore other group members are prevented from sharing their ideas as they occur to them."

Given this research, Furnham suggests that "if you have talented and motivated people, they should be encouraged to work alone when creativity is the highest priority."[45] However, he notes two exceptions to this conclusion, the first being the use of a highly trained facilitator: "Recent studies show that a brainstorming group that had a highly trained facilitator outperformed not only groups with a less trained facilitator but also nominal groups of individuals working alone."[46] The second exception is electronic brainstorming, which involves participants submitting their ideas anonymously online while simultaneously having access to others' ideas as they are produced. Studies of this method show that, unlike traditional brainstorming groups, performance increased with group size.[47] In addition, Furnham explains that electronic brainstorming aims to overcome the other issues with traditional brainstorming groups: social loafing, evaluation apprehension and production blocking. According to Furnham, "social loafing is less likely to occur due to concern that individual contributions are logged and counted. Evaluation apprehension does not occur as the source of the ideas is anonymous [brainstorming sessions]. Production blocking does not occur because ideas can be shared concurrently with other ideas."[48]

Despite there only being two exceptions, another study shows that hybrid brainstorming—where individuals first work independently and then work together—is also effective. The study examined the effectiveness of two group structures: the team structure (i.e., a traditional brainstorming group) and the hybrid structure: "Participants were divided into four clusters of either two or three groups of four subjects each. Two clusters were administered the hybrid treatment first followed by the team treatment and the other two were administered the team treatment first followed by the hybrid treatment."[49] Participants were asked to generate ideas on a new product for a manufacturing company within a set time frame. After this, they were asked to rank their best ideas. Participants in the team structure worked together in the same room throughout the entirety of the test. Participants in the hybrid structure worked independently to generate and rank ideas, then came together as a group to discuss their individual results and re-rank the ideas. The performance of a group was evaluated using "the quality of the *best* ideas identified" rather than "the average quality of ideas" or "the number of ideas generated."[50] The results showed that the highest level of innovation came from the hybrid structure. Additionally, the study found that "the frequently recommended brainstorming technique of building on others' ideas is counterproductive; teams exhibiting such build-up neither created more ideas, nor are the ideas that build on previous ideas better."[51]

However, despite years of evidence against traditional brainstorming groups, organizations continue to use this method today. Furnham explains "it's possible that brainstorming groups fulfil other needs in the organization, which may or may not compensate for the loss of creativity."[52] These needs may include the following:[53]

- "to increase decision acceptance: the group contributes to the solution and are therefore more likely to understand and carry out the decision than had the decision been made without their involvement";
- "to pool resources: the belief that bringing people together can increase the knowledge needed to make a good decision"; and
- "to benefit from specialization of labour: the potential quality of group efforts improves when the members only do those tasks for which they are best suited."

As a subscriber to brainstorming groups and group work in general, the RCAF should reexamine the purpose of using such methods. If the purpose is to strengthen bonds between employees, the continued use of group work is appropriate. If creativity is the goal, however, employees should be encouraged to work alone—at least at first.

CONCLUSION

It is important for RCAF leaders to know that up to 50% of members may be introverts, whether they appear that way or not. These members have unique advantages that can contribute to organizational success. However, extroverts are perceived to be better leaders, which makes them more likely to emerge as leaders in selection and promotion decisions. It is vital to be aware of this bias and understand that both extroverts and introverts have the potential to be successful leaders when organizations capitalize on their strengths. For organizations to do so, leaders must develop a thorough understanding of their members. The quickest method is to enable members to understand themselves; personality assessment tools can assist with this. Effective leaders will use this information to adapt their communication or work style to the situation in order to productively work with their members.

It is also important to understand that the work environment can have a strong influence on performance. In this regard, RCAF leaders must know that extroverts and introverts require different levels of stimulation to function well. Extroverts like open-plan offices and function well despite the noise around them. Their sociable and assertive traits are also conducive to group work. Conversely, introverts are most productive in quiet environments and prefer to work alone, allowing them to think deeply and critically before sharing their opinions with the group. To get the most out of introverts, RCAF leaders should accommodate their need for less stimulation by providing quiet and private spaces for solitary work as required, allowing the option to work from home and/or supporting the acquisition of noise-cancelling technology. The RCAF should also consider adjusting the traditional brainstorming approach for group work. A hybrid structure, where members first work alone and then come together to discuss their individual results, may be a good solution to address the preferences of both extroverts and introverts.

Understanding personality preferences can assist a leader in developing their own skills as well as effectively working with their members. The RCAF should ensure it embodies a balance of extroverted and introverted traits. This is particularly important for leadership positions to balance out these personalities' strengths and weaknesses, thereby creating a cohesive set of skills that advances the organization.

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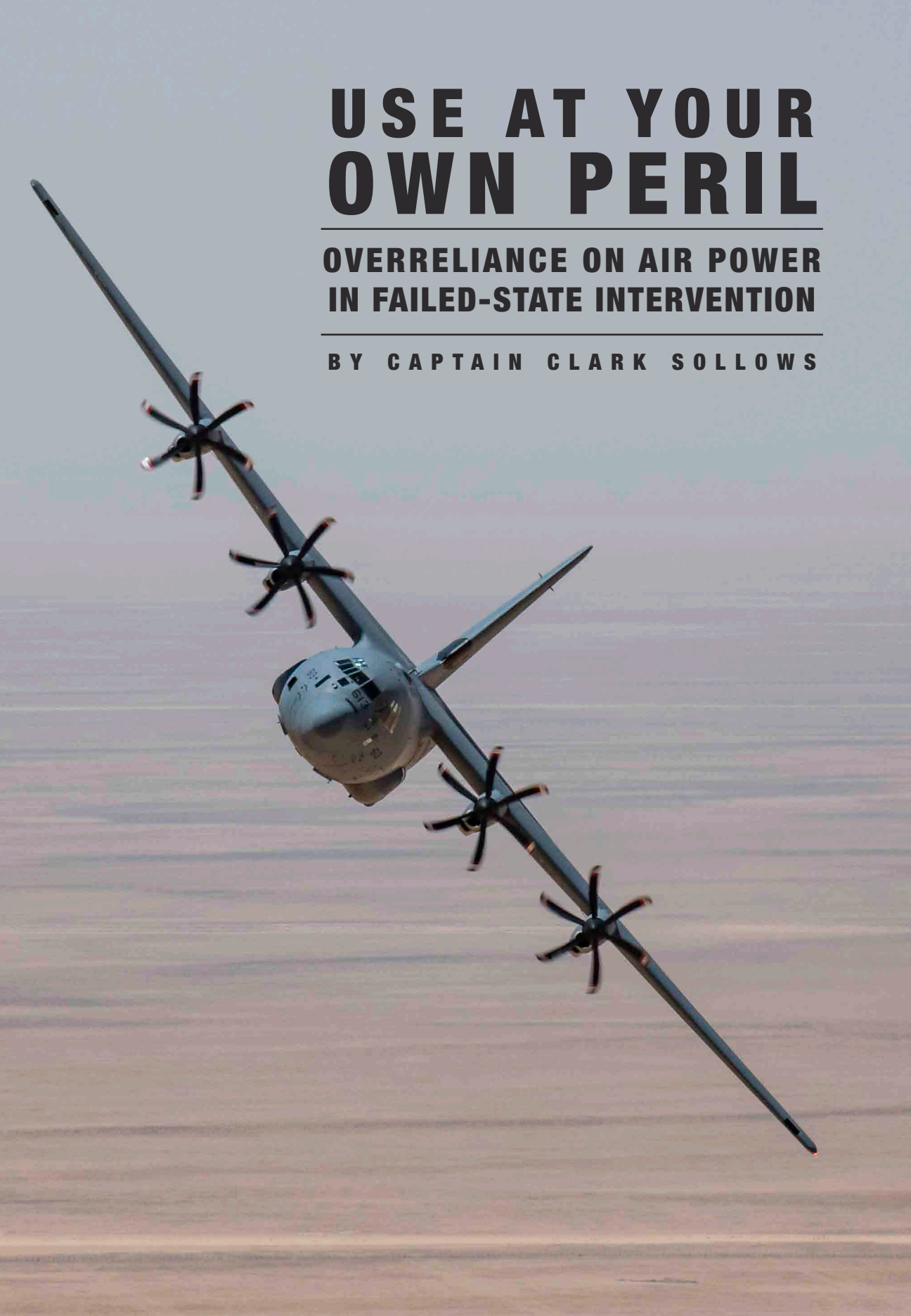
USE AT YOUR OWN PERIL

OVERRELIANCE ON AIR POWER IN FAILED-STATE INTERVENTION

BY CAPTAIN CLARK SOLLOWS



Editor's note: This paper was written by a candidate attending the Air and Space Power Operations Course in fulfilment of one of the requirements of the course of study.

Canada has many tools and resources it can draw upon to achieve and influence its geopolitical objectives around the world. Canada has a history of active participation in multinational efforts to assist failing states in various conditions of armed conflict, often using tools from a 3D approach—diplomacy, development and defence.[1] Air power is but a subset of the 3D toolbox, yet it is increasingly becoming a go-to option for Canada and its allies for fixing failed states, but for the wrong reasons. The increasing appetite for air power as a solution is because it carries less risk than ground forces, it can achieve military objectives comparatively more quickly and, therefore, cheaply, and it provides the perception of direct, tangible action in comparison to diplomacy and development. Any tools chosen to achieve geopolitical objectives, which for Canada are often a cessation of hostilities and stability, should be selected based on demonstrated effectiveness. The use of military tools must coincide with and complement elements of diplomacy and development to achieve overarching strategic objectives, which should always be the overall aim of the effort. This article will argue that an overreliance on air power in a failed-state intervention can have detrimental secondary effects that will hinder achieving overall geopolitical objectives. To make this argument, evidence both for and against the disproportionate use of air power will be presented, followed by an analysis of the evidence. The Royal Canadian Air Force's (RCAF's) 2011 air campaign in Libya will be used as a case study to underscore the arguments in this article. Finally, based on the evidence presented, recommendations will be offered to better prepare the RCAF and the Government of Canada (GC) for success in future failed-state interventions.

Stabilizing failing states and areas of conflict requires the right mix of resources from the international community. Canada has adapted its commitments to multinational-stabilization efforts to a whole-of-government approach, where a 3D methodology is employed. Canada has a strong and experienced diplomatic corps that has made successful contributions in the past to facilitate and negotiate diplomatic solutions to international conflicts.[2] Canada also has an active international development programme through Global Affairs Canada, which aims to provide stability in failing states by enabling host nation governments to provide basic services and infrastructure to their own citizens. Defence, the final tool in the 3D toolbox, has been employed by Canada in different capacities in failed states depending on the mission type and mandate. While no two missions are the same, common characteristics of Canada's recent military engagements abroad are that they have taken place in failed or failing states marred by civil war, an insurgency and where the government has not been able to protect its own citizens. Canada's war in Afghanistan (Operation [Op] ATHENA), intervention in Libya (Op MOBILE) and military engagement in Iraq and Syria (Op IMPACT) are examples of military missions abroad in the past decade that share these characteristics.[3]

In the future, the Canadian Armed Forces (CAF) is expected to continue to undertake missions in fragile or failing states. This expectation is highlighted in *Strong, Secure, Engaged: Canada's Defence Policy*, the most recent defence policy paper, in which two of Canada's future core mission are to "lead and/or contribute to international peace operations and stabilization missions with the United Nations [UN], NATO [North Atlantic Treaty Organization] and other multilateral partners"[4] and "lead and/or contribute forces to NATO and coalition efforts to deter and defeat adversaries, including terrorists, to support global stability."[5] Air power is a critical element in the military missions outlined in the defence policy paper. The RCAF and allied air forces possess essential core capabilities, which include control of the air, air attack, air mobility as well as intelligence, surveillance and reconnaissance. Air power also possesses characteristics that make it an attractive political tool for the GC when deciding on which 3D elements to use as a solution

for an intervention in a failed-state scenario. In particular, using air power carries less risk than land forces. Putting "boots on the ground" has gained a reputation for being messy, prolonged and susceptible to casualties, which have negative domestic political implications for the contributing nations. Put simply, Canadians are less likely to support a mission where members of their armed forces return in body bags. Air power can also achieve military objectives relatively quickly and comparatively cheaper than a long, drawn-out ground deployment. Finally, air power has a "shock and awe" effect, in that it is perceived by the general public as taking meaningful, concrete action. Diplomacy and development are more difficult to explain to and conceptualize for the average Canadian, and their effects are not as immediate as those that come with air power.

Gaining air superiority is an essential first objective in any military intervention, as it allows freedom of movement for friendly forces across the area of operations.[6] In the past, allied campaigns have achieved military victories using almost entirely air power in relatively short periods of time, such as in Kosovo during Op ALLIED FORCE and, more recently, in Libya as part of Op MOBILE. Because of these successes, there are many scholars and military brass that have touted the advantages of using an air power–heavy approach in failed states. For example, United States Air Force Major General J. Dunlap (Retired) argues that air power deserves a more prominent role in counter-insurgency (COIN) operations, which became the focus of NATO and allies during the lengthy campaigns in Iraq (2003–2011) and Afghanistan (2001–present). He contends that the airman's mentality, which favours science over the tradition-based thinking found in the army, fits better within COIN doctrine.[7] He goes on to refute the United States Army's well-regarded *Army Field Manual 3-24: Counterinsurgency*,[8] by arguing that it does not place nearly enough emphasis on air power: "Any complete COIN analysis for implementation in the joint environment must benefit from an air minded perspective."[9]

Others have written about NATO's sole use of air power to achieve strategic objectives. For example, respected RAND Corporation researcher Benjamin S. Lambeth advocates for a preference for air power over naval and ground forces and suggests that air power alone can win a war. He says that, for many, the first and second Gulf Wars proved that you do not need a large boots-on-the-ground presence to win.[10] "Air power's almost singular contribution to the defeat of Saddam Hussein's forces was an unprecedented historical achievement."[11] To the same refrain, Dr. Sebastian Ritchie of the Royal Air Force Centre for Air and Space Power Studies provides an analysis of the Royal Air Force's contribution in NATO's 2011 Libya campaign, in which he notes the Royal Air Force had good reason to be satisfied with the campaign's outcome and describes in detail the instrumental role air power played in achieving victory.[12] He contends that "the political advantages of the air and [special forces]–based approach may be gauged from the fact that strategic victory was achieved in Libya in a period of just seven months with no formal land component, with no coalition casualties, with only a handful of civilians and rebels being killed by coalition fire and at a tiny fraction of the cost of the operations in Iraq and Afghanistan."[13]

People working within NATO have also touted the benefits of the air-centric campaign. Ivo Daalder, the United States's (US's) permanent representative on the council of NATO, wrote an article titled "NATO's Victory in Libya" a few months after NATO had completed its mission. In the article, he hails the conflict as a model mission and goes on to list a number of positive features of the operation that suggest it was the right way to run an intervention. He notes the speed with which the coalition came together, the lack of casualties and the relatively low cost of the operation as teachable moments for the future.[14] He also notes that the air campaign proved NATO was up to the task of solving international crises in increasing capacity. "The intervention in Libya also demonstrated that a politically cohesive NATO can tackle increasingly complex, and increasingly global, security challenges."[15]

While many have placed emphasis on the benefits of using an air campaign to win wars in failed states, other have argued the contrary. The argument is that while air power is undeniably critical in

any military intervention, the war cannot be won with air power alone. For example, in his book, *Friends in High Places – Air Power in Irregular Warfare*, Dr. Sanu Kainikara of the Royal Australian Air Force Air Power Development Centre discusses some limitations that should be considered. Air power in COIN operations in Iraq and the war on terror in Afghanistan (both of which were failing states) are examined, and the author concludes that air attack must be limited and effects based. Air attack in particular, notes the author, often becomes heavily relied on because it resonates with aviators and air planners as it dominates air force thinking and doctrine.[16] Arguably, the primary focus of RCAF doctrine is kinetic air attack capabilities. Groupthink of RCAF commanders and their planning staffs may inevitably lead to dropping bombs from CF188s as the preferred course of action because that is the primary vision of air power that they have in their minds due to the doctrine taught throughout their careers. "While such a response may achieve the short-term political aim of a high-visibility low-risk response, without concerted long-term full spectrum approach, it is unlikely to have any enduring success."[17] The author concludes with a warning of applying air force doctrine, which is centered on conventional warfare, to irregular wars, which are often fought in failed or failing states. "Air power has many strengths in modern warfare, but its utility in irregular wars is not well understood. Many of air power's traditional strengths, such as strategic strike, have limited impact in irregular wars and its ambiguous environment."[18]

The effects of limited strike campaigns were examined by RAND in an extensive study on limited intervention. Looking at drone strikes, the study concluded that such campaigns were ineffective in failing states. For example, RAND compared the use of drone warfare in Pakistan, a country with a functioning central government, with its use in Yemen, which had a collapsing government. They found that the drone strikes in the failing state resulted in the opposite of what was desired.

> The results of U.S. drone strikes in Yemen, however, were almost entirely different. Moreover, the strikes were conducted in a country in which the central government was collapsing. In this context, U.S. drone strikes not only failed to weaken the militants but also, in general, appeared to have had counterproductive results—that is, the recruitment effects appear to have substantially exceeded the disruption effects.[19]

They also found that local militant attacks and propaganda output both increased in the weeks following drone strikes.[20]

Canadian Helicopter Force (Afghanistan), Task Force Freedom's Griffon Helicopter Pilots and Door Gunners stay current by practicing their enemy engagement drills at Texas Helo Range. Flying in evasive maneuvers while engaging targets allows the entire Griffon crew to stay at the top of their game so that when a real threat is encountered they are able to neutralize it with precision.

The reliance on air power in failed-state interventions has also been analysed from an ethical viewpoint. Clive Blount of the Royal Air Force Centre for Air Power Studies argues that, for air power to be useful in the future, it must be acceptable from an ethical and moral perspective. "The ability to make sense of a difficult, confused situation and to reassure leaders and populations of the efficacy and legitimacy of air power actions will be increasingly important."[21] How air interventions that attack woefully inferior enemies in failed states fit in with broader geopolitical goals is something commanders in the RCAF should be aware of in terms of messaging to the general public. The theme surrounding the ethical implications of air power in asymmetric warfare is repeated by M. A. Ashraf in his article in *Air Power, Insurgency and the War on Terror.* He suggests that, due to a history of bombing civilians / collateral damage, "more than any other form of military activity, air power has influenced the ethical debate in warfare."[22] He goes on to argue that the ethical implications of air power are directly related to the political battle in warfare. He notes that, while collateral damage and a small number of civilian casualties may be acceptable militarily, it can be detrimental in terms of domestic and host-nation political support. "In the age of precision-guided weapons we need precision-guided strategic thinking. The air battle and the political battle have to be synchronized."[23]

In the argument for a reliance on air power to win Canadian and NATO interventions abroad, which have been predominately in failed or failing states since the turn of the century, it is hard to deny the benefits that air power brings to the battlefield. After air superiority is attained, owning the skies allows for freedom of movement across the battlespace, where intelligence, surveillance and reconnaissance combined with bombing and precision strike can quickly and effectively defeat opposing forces. Doctrinally, the RCAF is taught how to employ and deliver these capabilities at the strategic, operational and tactical levels. However, the major flaw with this planning and employment in the context of failed-state intervention is that RCAF doctrine is too narrow in scope to be successful beyond purely military objectives.

RCAF doctrine—while appropriate and effective to achieve tactical, operational and strategic *military* objectives—misses the mark in harmonizing and complementing overarching GC *geopolitical* objectives. If the strategic military objectives of an RCAF operation do not align with the overall strategic objectives of the GC, then what is the point? In *Strong, Secure, Engaged: Canada's Defence Policy* (*SSE*), harmonizing the efforts of the military within broader GC efforts is a cornerstone of the document. This is explicitly outlined in an opening message from the Minister of Foreign Affairs, which is presented immediately after the opening message from the Minister of National Defence. The Minister of Foreign Affairs notes, "Our focus is to ensure that our foreign, defence, development, and trade policies reinforce one another and deliver results for the people we serve: Canadians."[24] In Chapter 5 of *SSE,* the document outlines a new vision for defence: "Most often, Canada's military action will be applied as part of a coherent, coordinated, whole-of-government effort in concert with diplomatic engagement, humanitarian and development aid, and other measures."[25]

Furthermore, the document identifies three actions to achieve a new approach to defence: anticipate, adapt and act. The CAF collaborating with other government departments in a whole-of-government approach is interwoven in the document in each of these three actions. For example, under "act," the document says "peace support efforts by the Canadian Armed Forces will be complementary to broader government objectives and whole-of-government efforts to prevent conflict, stabilize fragile situations and combat threats. The Canadian Armed Forces will collaborate closely with other relevant departments and agencies on a more integrated approach to operational-level planning of peace support and stabilization missions."[26]

Upon reading the latest iteration of the capstone B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine* document, it appears it has not caught up with *SSE*. The doctrine offers only a cursory notion of working with other GC departments to achieve strategic geopolitical objectives.

It says the doctrine can be integrated into a whole-of-government or comprehensive approach to achieve national strategic effects, but fails to elaborate.[27] Compared to *SSE*, where collaboration and integration with other government departments to achieve strategic effects for the GC are main anchor points of the publication, it appears they are afterthoughts in the doctrine. As a result, they are also afterthoughts for air planners who use the doctrine as guidance. Air planners and commanders must examine the secondary effects of the air campaign and ensure those effects synergize with diplomatic and development efforts and support the overarching geopolitical strategic effect that is desired. Failure to consider secondary effects or engage other government departments, especially while operating in a failing or failed state, can have detrimental consequences to the overall GC effort.

The RCAF's campaign in Libya is a prime example of a time when the strategic military objectives did not harmonize with the overall GC geopolitical objectives, nor were secondary effects properly considered. NATO initially went into Libya under UN Security Council Resolutions 1970 (2011) and 1973 (2011), the United Nations Security Council's first unanimous decision to invoke responsibility to protect (R2P).[28] R2P was designed by the UN to compel member states to act in instances of genocide, ethnic cleansing and crimes against humanity. Despite early success in the offensive air campaign in Libya, the coalition suffered from mission creep, where regime change became the end state under the guise of R2P.[29] The GC, Department of National Defence and NATO failed to consider that meeting military objectives ran counter to the geopolitical strategic objectives for Libya. The resulting power vacuum in the failed state, without a functioning central government, further inflamed fighting among militant groups, all vying for control of the country. The resulting lawlessness created the conditions which were ripe for terrorist groups, namely the Islamic State in Iraq and Syria (ISIS), to later base their African operations. The resulting humanitarian catastrophe, human trafficking and massive displacement of affected people are things the world is still dealing with eight years after the intervention ended. Massive weapons caches belonging to the regime of Muammar Gaddafi were raided and proliferated to various militant and Islamic terrorist groups.[30] Canada displayed a clear overreliance on air power to achieve its strategic geopolitical objectives, which was a serious miscalculation. Not nearly enough resources from the diplomacy and development toolbox were committed to address "the day after," a similar mistake made by the US in the second Iraq War.

Master Corporal Jeff Hanlin (left), Corporal (Cpl) Jacek Pyrek (centre) and Cpl Nicolas Hendsbee, Task Force Libeccio Air Weapons Systems Technicians, load a GBU-31 Joint Direct Attack Munitions bomb using a MJ-1 Bomb loader on a CF-18 aircraft in Trapani, Italy on 10 October 2011.

In the months after the end of the mission, the GC considered the effort a success and even held an elaborate military parade on Parliament Hill to celebrate the victory. The Canadian general who commanded the mission, Lieutenant-General Charles Bouchard, said at the time, "Libya and Libyans are the true victors of this campaign. They have won their war and every day, as we see it, they are winning their peace."[31] In the years following the intervention, the situation in Libya was far from a peaceful reality. NATO and Canada's strategic failure and overreliance on air intervention has been written about extensively in the years after the conflict. For example, a Canadian Forces College (CFC) paper examined the shortcoming of the NATO intervention. The paper noted that NATO was not prepared to address the problems post conflict and displayed a general lack of understanding of the politically agreed desired outcome. "The coalition's mission creep combined with the mishandling of the post-conflict situations in Libya severely damaged NATO's credibility for future intervention in human security affairs."[32] NATO's inability to harmonize its military objectives with political objectives led to mission creep and regime change, which was counterproductive in the long run.

Another CFC paper looked at the second-order effects caused by the air intervention and argued that it was these effects that influenced the geopolitical end state of the region. NATO failed to understand these second-order effects, resulting in a disjointed military versus political strategy that had conflicting objectives. "The NATO intervention prolonged the war, decreased the chances of a negotiated peace, and failed to properly prepare for post-conflict stabilization. This has resulted in second order effects of Libyan state instability, regional instability and increased humanitarian crisis."[33]

More holistically, a different CFC paper provided an extensive examination of the limitations of military interventions in failed states. The paper concludes that there is an erroneous belief by the GC and decision makers within the CAF that a military intervention alone can reverse the course of a failed state and provide peace and stability. "It is clear that policy makers and decision makers do not fully understand the limitations of the [Canadian Forces] in effecting positive change within a failed or failing state,"[34] and, "unfortunately, given the size and cost of military deployments, governments have had outsized and unrealistic expectations of what can be achieved militarily in these circumstances."[35] Limiting the military intervention to an air intervention further exacerbates the problem, as boots on the ground are essential in providing security immediately after the conflict to ensure transitional government and civilian authorities can provide essential services to citizens. The absence of essential services (e.g., food, water and medical aid) quickly frustrates the population and can rapidly lead to more violence, similar to what was observed in Libya.

This article provides a number of lessons learned for leaders of the RCAF. With an updated defence policy that has CAF working with other government departments in our interventions abroad throughout the spectrum of conflict, RCAF commanders must ensure the government is aware of air power's limitations, particularly when working in failed or failing states. To do anything else is a disservice to the overall strategic objectives and national interests of Canada. Currently, it is not clear the extent to which junior and senior leaders in the RCAF are self-aware of these limitations. With a can-do attitude, aviators are eager to be force employed in as many different situations as possible. RCAF doctrine should be further refined to remind leaders that air power is but one tool in the toolbox and cannot work in isolation to achieve strategic geopolitical effects. History has demonstrated that this approach is destined to fail. The RCAF must work closely with and complement the efforts of other government agencies from the diplomatic and development corps. Our doctrine should also be refined to include analysis of second-order effects from air power at the tactical, operational and strategic levels. A full analysis of second-order effects, while also working with other government departments, will much better prepare the GC and the RCAF for understanding and preparing for what happens "the day after" armed conflict ends.

In summary, this article examined armed interventions using air power by the RCAF and allies in failed or failing states. It argued that an overreliance on air power in a failed-state intervention can cause detrimental secondary effects that will hinder achieving overall geopolitical objectives. Arguments advocating for a disproportional use of air power point to the advantages of such an approach in achieving military objectives. However, as this article discusses, such arguments are made within the narrow scope of military objectives and not in the greater scope of geopolitical objectives, which often are not synonymous. When military objectives are not synchronized with geopolitical objectives, counterproductive results can occur. This article proposes that the RCAF should refine its doctrine to make leaders better aware of the limitations of air power while also considering secondary effects. The doctrine should better emphasize working closely with other departments in the GC to harmonize efforts and achieve the desired end state.

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ABBREVIATIONS

3D	diplomacy, development and defence
CAF	Canadian Armed Forces
CFC	Canadian Forces College
COIN	counter-insurgency
DND	Department of National Defence
GC	Government of Canada
Op	operation
R2P	responsibility to protect
SSE	*Strong, Secure, Engaged: Canada's Defence Policy*

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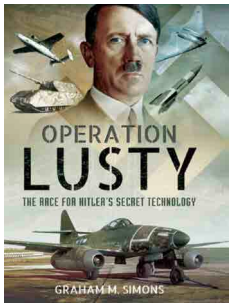
BOOK REVIEWS



OPERATION LUSTY: THE RACE FOR HITLER'S TECHNOLOGY
By Graham M. Simons

Barnsley, South Yorkshire, UK: Pen & Sword Books, 2016
270 pages
ISBN 9781473847378

Review by **Major Bill March, CD (Retired)**

Well before the end of the Second World War, Allied air forces were laying the groundwork to acquire and exploit captured German technology. An inventive and ruthless adversary, Nazi Germany's list of advanced projects was impressive, ranging from jet aircraft such as the Messerschmitt Me-262 to V2 ballistic missiles. These notable examples of German ingenuity were ones that Allied forces faced on the battlefield; perhaps even more impressive were those scientific and military projects under development, many of which never made it into production. These "spoils of war" were highly sought after by the victors as they jockeyed for position in the lead up to the Cold War. The planning, conduct, successes and failures of this post–Second World War treasure hunt form the basis for Graham M. Simons' book.

Organized in roughly chronological fashion, Simons begins by describing some of the *Wunderwaffen* (wonder weapons) that an increasingly desperate Nazi regime pinned its hopes on in the closing months of the war. These range from the truly amazing to the truly bizarre. However, exploitation of enemy technology, whether to find its weakness or blatantly copy it, was, and is, an important part of modern war. This is a point that the author makes in his second chapter as he examines—from primarily a British perspective—how the "Rafwaffe" made use of advanced German aircraft that came into its possession either by capture or misadventure. Included are some very interesting images of German aircraft in Royal Air Force markings.

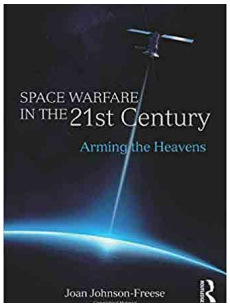
Having set the stage with respect to the level of enemy technology and why it was important, Simons spends the majority of the rest of his book describing the astonishing number of programmes put in place by both the British and the Americans to make sure they wrung out all of Germany's technological secrets. The rather innocuous names given to the various operations, such as LUSTY, OVERCAST and PAPERCLIP, belie the cut-throat nature of the business. It was important that the West beat the Soviets to the treasure; however, in many cases it was equally important to make sure that the choice bits of that treasure went to the right Western nation, either Britain or the United States, depending on who was in charge.

An extraordinary part of the story was the relatively small number of personnel actually charged with locating and retrieving the desired technology and the associated German scientists and engineers. While there were thousands of men and women from all branches of the Allied forces, including members of the Royal Canadian Air Force, who captured, processed and transported the "items," the number of personnel who were "in the know" numbered in the low hundreds. Although not a subject that Simons examines in any detail, the key Allied personnel were prepared to overlook any culpability of select German personnel in war crimes if they had skills and knowledge that could be exploited.

In his concluding chapters, the author provides a glimpse of French efforts—small as they were—to join in the exploitation frenzy. He also comments on the mainly American efforts to capitalize on any advanced technology found in Japan after that country capitulated in August 1945. Although not necessary for the book, Simons' final words address the multitude of unidentified-flying-object flights of fantasy spawned by outrageous claims made about German *Wunderwaffen*. The author leaves no doubt where he comes down on all of these theories.

Although not an easy read (there are sections of the book that seem more like a military briefing than a commercial publication), *Operation LUSTY: The Race for Hitler's Technology* is worth the effort. It contains a fount of information on that less-often-studied period immediately following the Second World War and provides insight into the benefits and pitfalls of scientific exploitation of a vanquished enemy. This will undoubtedly be an element of future conflicts, and if you think it will be easy, then I suggest you read this book—especially the part about patent law and how it affects the use of post-conflict-acquired technology.

Bill March, a retired maritime combat systems officer, is currently pursuing a PhD in History at Queen's University in Kingston, Ontario.



SPACE WARFARE IN THE 21ST CENTURY: ARMING THE HEAVENS
By Joan Johnson-Freese

New York, Routledge, 2017
202 pages
ISBN 9781138693883

Review by **Stephen Bright**

The title of this important book by Professor Joan Johnson-Freese looks forward, while the book itself starts by looking in the rear-view mirror. From beginning to end, readers are expertly guided through the uncertain landscape of space warfare.

The opening chapter by Johnson-Freese, professor of National Security Affairs at the United States Naval War College, situates American interests in, and plans for, space in history. This context is useful for her ensuing discussion of contemporary space policies and their implications.

Throughout her book, Johnson-Freese advocates for the United States (US) to be the prime mover in space-warfare policy: "A robust US military space program is an absolute imperative."[1] Yet, at the same time, in her view, US space policy has "to be part of a larger, well-thought-through, comprehensive, budget-responsible, non-fear-driven approach to achieving" stability in space.[2]

In articulating that balance, Johnson-Freese hinges much of her argument on two triads: "congested, contested and competitive"[3] and "deter, defend, defeat."[4] The former describes the space environment, while the latter frames prevailing US thought about that country's necessary actions when it comes to space warfare.

That space is both congested and competitive is, to Johnson-Freese, neither surprising nor contentious. It's the "contested" part of this triad that she's most concerned with, as this "appears to drive US national security space strategy and, consequently, signals US intent that potentially influence [*sic*] other countries."[5] State—and, in the era of SpaceX and other commercial space-exploration endeavours, perhaps non-state—reactions to these signals, in turn, could make conflict in space inevitable.

As a counter to any such notions of inevitability, Johnson-Freese calls for vigorous, multiparty dialogue to avoid a purposeful and/or accidental blast into space warfare. She also cautions against placid acceptance of military planning that, in her opinion, would make space conflict "a self-fulfilling prophecy."[6] The dangerous risks of falling into this trap, she writes, are found in another alliterative triad: "mishap, mis-interpretation, and mis-calculation."[7] Any one of these three things happening could have devastating consequences for military and political stability—not to mention all of humanity—when considering the potential power of space weapons. Taken together, the results could be catastrophic.

The deployment of space-warfare technology, however, isn't at that point. Thankfully, there are no case studies yet of deterring, defending or defeating an enemy in (or from) space. So, it is still conjecture—something that may or may not happen in the future. And it's that not-so-distant horizon to which Johnson-Freese draws our attention. By skilfully laying out antecedents, current thinking and the potential capabilities of space conflict, she urges readers to actively engage themselves in issues germane to space warfare as well as in the wider universe of thorny issues such as ethics, governance, sovereignty and hegemony that underpin and are variously expressed in space warfare. In so doing, Johnson-Freese raises our awareness both literally and figuratively.

Consider President Dwight D. Eisenhower's famous farewell speech. On January 17, 1961, he warned Americans about threats to their democracy from the hydra-like reach and resilience of the country's "military-industrial complex."[8] Today, in 2020, that complex has taken on celestial dimensions. Thus, to what extent can—or, indeed, should—"the beast" (as Johnson-Freese calls, in Chapter 5, the enormous US military budget, of which space programmes are a part) be limited, when companies like Google are developing relationships with the Pentagon?[9]

The import of these issues resonates for many reasons. On August 29 of last year, for instance, President Donald Trump introduced the United States Space Command (SPACECOM) from the Rose Garden of the White House. "As the newest combatant command, SPACECOM will defend America's vital interests in space—the next warfighting domain," Trump said at the time. "And I think that's pretty obvious to everybody. It's all about space."[10] Similarly, Canadian readers generally—and members of the Royal Canadian Air Force more specifically—could read this book while keeping in mind what *Strong, Secure, Engaged: Canada's Defence Policy* says about the space domain: namely, "Canada must develop advanced space and cyber capabilities, and expand cutting-edge research and development."[11]

In sum, many books collapse under the weight of narrative constructs such as deter, defend and defeat and congested, contested and competitive. This book does not. Moving with academic swiftness through her well-sourced arguments, Johnson-Freese informs, scares, inspires and motivates her readers on a topic she has been writing about for more than 30 years. I thoroughly

enjoyed this book, and I took away many new perspectives on the increasingly important issues connected to space warfare. Ample footnotes direct readers to additional resources from which to learn more about the evolution and implications of space conflict.

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NOTES

1. Joan Johnson-Freese, *Space Warfare in the 21st Century: Arming the Heavens* (New York: Routledge, 2017), 17.

2. Johnson-Freese, *Space Warfare in the 21st Century*, 17.

3. Johnson-Freese, *Space Warfare in the 21st Century*, 16.

4. Johnson-Freese, *Space Warfare in the 21st Century*, 81.

5. Johnson-Freese, *Space Warfare in the 21st Century*, 27.

6. Johnson-Freese, *Space Warfare in the 21st Century*, 74.

7. Johnson-Freese, *Space Warfare in the 21st Century*, 75.

8. To quote the relevant passage from that speech: "In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist. WE MUST NEVER let the weight of this combination endanger our liberties or democratic processes." "The Farewell Address," Dwight D. Eisenhower Presidential Library, Museum and Boyhood Home, January 17, 1961, https://www.eisenhowerlibrary.gov/research/online-documents/farewell-address. [upper-case emphasis in original]

9. Johnson-Freese, *Space Warfare in the 21st Century*, 104–30.

10. United States, "Remarks by President Trump at Event Establishing the U.S. Space Command," The White House, August 29, 2019, https://www.whitehouse.gov/briefings-statements/remarks-president-trump-event-establishing-u-s-space-command/.

11. Canada, Department of National Defence, *Strong, Secure, Engaged: Canada's Defence Policy* (Ottawa: DND, 2017), 57, https://www.canada.ca/en/department-national-defence/corporate/policies-standards/canada-defence-policy.html?utm_source=dgpaapp&utm_medium=referral&utm_campaign=redirect. It should be noted that this policy also uses "congested, contested and competitive" in talking about space.