

THE ROYAL CANADIAN AIR FORCE JOURNAL

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PRODUCED BY THE ROYAL CANADIAN AIR FORCE



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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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THE ROYAL CANADIAN
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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.

JOURNAL SECTIONS

Item	Word Limit*	Details
Letters to the Editor	50–250	Commentary on any portion of a previous <i>RCAFJ</i> .
Articles	3000–5000	Written in academic style.
Book Reviews	500–1000	Written in academic style and must include: <ul style="list-style-type: none">• the book's complete title (including subtitle);• the complete names of all authors as presented on the title page;• the book's publisher, including where and when it was published;• the book's ISBN and number of pages; and• a high resolution .jpg file (at least 300 dpi and 5 by 7 inches) of the book's cover.
Points of Interest	250–1000	Information on any topic (including operations, exercises and anniversaries) that is of interest to the broader aerospace audience.
Pushing the Envelope	250–2000	Forum for commentary, opinions and rebuttal on <i>RCAFJ</i> articles and/or issues that are of interest to the broader aerospace audience.
Point/Counterpoint	1500–2000	Forum to permit a specific issue of interest to the RCAF to be examined from two contrasting points of view.

* Exclusive of endnotes

AUTHORS ARE ASKED TO NOTE THE FOLLOWING GUIDELINES:

- Submissions may be made in either official language.
- Authors must include a brief (one paragraph) biographical sketch which includes current appointment/position, telephone number and email address. Please include all professional and academic designations as well as military decorations.
- Selected articles that have been peer reviewed have a  to the left of the title.
- The Senior Editor will notify contributors on the status of their submission. It may not be possible to publish all submissions.
- All text submissions must be digital, in Microsoft Word or rich text format. Files must not be password protected and must not contain macros. Files may be submitted by mail or email at the addresses provided below.
- All supporting tables, images and figures that accompany the text should be sent in separate files in the original file format (i.e., not imbedded in the text). Original vector files are preferred; high resolution (not less than 300 dpi) .psd or .jpg files may be submitted.
- Authors are now required to provide “alternate text” with detailed description for all figures. The alternate text is to be labelled as such and placed below the caption.
- Copyright permissions are required for all material that is not Department of National Defence or author originated. It is the author's responsibility to obtain and submit the necessary written permissions which must include the author's/artist's name as well as the publisher's name and location. Any material not meeting these requirements may be omitted from the article.
- The Senior Editor may select images or have graphics created to accompany submissions.
- Authors should use *Oxford English* or *Petit Robert* spelling. When required, reference notes should be endnotes rather than footnotes and formatted in Chicago style. For assistance refer to *The Chicago Manual of Style, 16th Edition*, *Le guide du rédacteur* or CFAWC Production Section at CFAWCProd@forces.gc.ca
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 - If they are required in the text, the term is to be written out in full the first time it is used and then followed by the abbreviated form in parentheses.
 - A list of all abbreviations (and their terms) used in the text will be included at the end of each submission.
- The Senior Editor reserves the right to edit submissions for style, grammar and length but will not make editorial changes that will affect the integrity of the argument without consulting the author.

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Call for Submissions

For the Fall 2015 issue: 30 July 2015

For the Winter 2016 issue: 30 October 2015

For the Spring 2016 issue: 30 January 2016

For the Summer 2016 issue: 30 April 2016

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EDITOR'S MESSAGE

As strange as it might seem, I am actually going to use my comments in this issue of the *Journal* to talk about the Spring and Summer 2015 issues. I do believe this is necessary to minimize confusion over the approach taken by the editorial and production staff at the Canadian Forces Aerospace Warfare Centre and to emphasize the focus of these issues. So bear with me as you read on, and all should be clear by the end of this short article.

Some of you may be aware that the *Royal Canadian Air Force Journal (RCAFJ)* is, for all practicable purposes, one issue behind in its production schedule. To rectify this situation and to bring the schedule back in line with the deadlines for submissions, the Spring and Summer issues will be combined into a single, albeit larger, issue. Therefore, Volume 4 of the *RCAFJ* will contain Winter, Spring/Summer and Fall issues—for a total of three rather than the usual four issues. This one-time adaption of the *Journal* re-synchronizes the “Call for Submissions” dates included in the front matter of the *Journal* with the production schedule.

In addition, we were also considering the most cost-effective manner by which we could commemorate some of the important Royal Canadian Air Force (RCAF) milestones that will take place during the lead-up to our 100th anniversary in 2024. A recommendation to dedicate one issue of the *Journal* per volume to the major commemorative event or theme being addressed that year was approved. This approach allows the RCAF to celebrate its history and heritage via a theme-focused publication available to a broad audience at minimal additional cost, as the respective commemorative issue is already part of the regular production schedule. Any additional costs will be associated with contracting out articles to flesh out the commemorative story, acquiring additional images and increasing the print run. A commemorative issue of the *Journal* will contain only articles/items related to the relevant event and additional images (eye candy) for the reader.

The combined Spring/Summer 2015 issue of the *RCAFJ* will be the inaugural commemorative issue. It will focus on the 75th anniversary of the Battle of Britain and the participation therein by the RCAF and Canadians serving in the Royal Air Force and will be available by September 2015—in plenty of time for celebratory events. Additional copies of the *Journal* will be available while quantities last. I do hope that this issue will be well received.

Enjoy the read. 

Sic Itur Ad Astra



Major William March, CD, MA
Senior Editor

Abbreviations

RCAF Royal Canadian Air Force

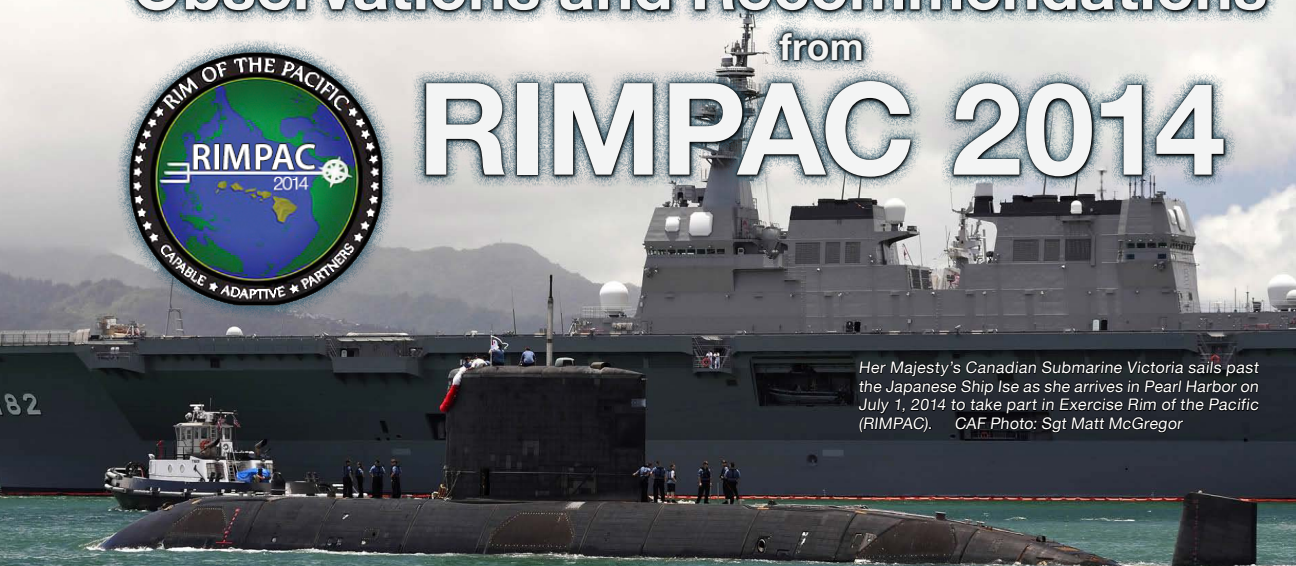
RCAFJ *Royal Canadian Air Force Journal*

CFACC and CAOC

Observations and Recommendations

from

RIMPAC 2014



Her Majesty's Canadian Submarine Victoria sails past the Japanese Ship Ise as she arrives in Pearl Harbor on July 1, 2014 to take part in Exercise Rim of the Pacific (RIMPAC). CAF Photo: Sgt Matt McGregor

By Colonel David Lowthian, MSM, CD, MSS

Editor's note: As part of the ongoing education and training in command and control (C2) within the RCAF, much of what we teach is practised, honed and improved upon during exercises. Exercise Rim of the Pacific offers an excellent opportunity to practise joint C2 in key leadership positions. In this latest in a series of RCAF articles on C2, Colonel David Lowthian offers insights into his experience during RIMPAC 2014 as the Deputy Combined Forces Air Component Commander.

Exercise Rim of the Pacific (RIMPAC) continues to be the premier multinational training exercise. It provides an exceptional training and learning environment through serialized and free-play events that increase in tempo and magnitude as the exercise progresses. Although it is maritime-centric, it offers tremendous benefit to Royal Canadian Air Force (RCAF) personnel, greatly enhancing their understanding of tactical capabilities. RIMPAC 2014 included approximately 340 RCAF men and women operating in air-component roles. These roles included four tactical detachments (CP140, CC130T, CC150T and CF188), the air task force (ATF) / air expeditionary wing (AEW), key positions within the combined air operations centre (CAOC), fighter controllers located at the Hawaiian Radar Operations Centre as well as two key leadership positions (the Deputy Combined Forces Air Component Commander [CFACC] and the Deputy Commander Combined Task Force 172 [Maritime Patrol]). Each of the air-component entities provided lessons learned through their respective chains of command. This article reflects on the functions and responsibilities of the CFACC and CAOC and identifies areas where RCAF contributions to future coalition operations and exercises can be improved.

During RIMPAC 2014, the CFACC and Deputy CFACC were non-United States (US) military personnel, demonstrating the efficacy of multinational interoperability, doctrine, education and professional development programmes. This is also reflective of the trust that the US military has in its multinational partners in a region that is becoming of increasing strategic importance. Additionally, numerous senior positions within the components and the CAOC were apportioned to Canada, indicative of the credibility RCAF personnel have gained within the US military.

The CFACC is responsible for planning, coordinating and executing an air campaign, utilizing over 200 aircraft—including over 100 fighters—that fly approximately 4,000 sorties during the three-week exercise. The CFACC has a broad span of control that is heavily dependent upon reliable communications; this is a difficult undertaking, given that many stations operate and communicate on non-compatible networks.¹

The CFACC must clearly identify their priorities and communicate them effectively down the chain of command. This was done very effectively during RIMPAC 2014. The CFACC's priorities were: first, support the Commander Combined Task Force (CCTF); second, maximize training opportunities wherever possible; third, safety is paramount; and fourth, *malama ka'aina*—respect the environment. Command is only one of the CFACC's roles; in RIMPAC 2014, the CFACC was also the airspace control authority (ACA) and the area air defence commander (AADC). This is in accordance with doctrine, which highlights these and additional responsibilities for the CFACC, such as space coordinating authority² as well as intelligence, surveillance and reconnaissance (ISR) coordination.

As ACA, the CFACC was responsible for deconfliction with Federal Aviation Administration authorities and for the production, oversight and enforcement of ACA directives: airspace control plan (ACP), airspace control order (ACO) and special instructions (SPINS). Real-world civilian and military aircraft were a safety concern throughout the exercise, particularly as exercise tempo and operational complexity increased. Additionally, environmental considerations related to munitions, ranges and noise had to be taken into consideration by the CFACC.

As AADC, the CFACC was accountable to not only the CCTF, but also to the 22 contributing nations, as air-defence operations must be coordinated with all tactical operations on and over both land and sea. This involved the development of an area air defence plan (AADP) and the coordination of activities between the maritime and air components, which began four months prior to the commencement of RIMPAC during the staff exercise (STAFFEX) event. Regional defence agencies must coordinate and deconflict activities, particularly when both sea- and land-based air-defence and air-control capabilities are committed to the operation. This includes clearly communicating and delineating areas of responsibility, defensive-counter-air (DCA) coverage and alert postures, radio procedures, corridor and tanker operations as well as surface-to-air capabilities. Holes in coverage as well as procedural flaws must be identified and rectified; otherwise, there is an increased risk of fratricide and catastrophic losses at the outset of hostilities.

As with any operation or exercise, much of the CFACC's effort is committed to developing and building relationships within a joint, interagency, multinational and public (JIMP) context. Above all, components must coordinate their efforts as supported and supporting commanders; this requires substantial effort and time, especially within a multinational operating environment. This philosophy must resonate at all levels within the CFACC chain of command. Although air components rely on decentralized efficiency in operations, the commander's intent must be clearly communicated through instruments of mission command such as: mass air briefings, air operations directives, mission analysis, targeting boards and planning groups.

Delegation of authorities is an important element to mission command. The CFACC, with Judge Advocate General (JAG) assistance, developed a delegation of authorities matrix (Table 1) to account for an array of operational eventualities so that decisions and actions were not interrupted by process. This tool was extremely effective during RIMPAC 2014, especially so during dynamic and time-sensitive targeting events.

	Division	Sub-Division	Combat Plan	CCO	CAOC Dir	D/CFACC	CFACC	CCTF
Targeting	Target Engagement	Pre-Hostilities				X	X	
		Combat Operations		X	X	X	X	
	Dynamic Targeting	Wet – CFMCC				X	X	
		Dry – Overland		X	X	X	X	
	Collateral Damage	Level 1–3		X	X	X	X	
		Level 4*				X	X	
		Level 5*						X
	Targeting Board Approvals	HVTL/HPTL				X	X	
		TST						X
		JPTL						X
PR	Personnel Recovery	Low Risk		X	X	X	X	
		Medium–High Risk				X	X	
Task	Change to Alert Status	Pre-Hostilities				X	X	
		Combat Operations		X	X	X	X	
	Re-Roll Tasking	No Loss in Capability		X	X	X	X	
		Gap in Capability				X	X	
OPP	Deliberate Operations	Supported				X	X	
		Supporting		X	X	X	X	
ORM	Hazard Risk Index (HRI)	<9 High–Extreme				X	X	
		10–17 Medium			X	X	X	
		18–20 Low	X	X	X	X	X	
Comms	Internal	C2 System Shut Down				X	X	
		Comms Lockdown			X	X	X	
	External – Media	Exercise Event		X	X	X	X	
		National			X	X	X	
		Real Life Event				X	X	
Products	ACO, ACP, AADP, CAOP, MAAP					X	X	
	SPINS, ATO, SITREP			X	X	X	X	
	Battle Rhythm Deliverables		X	X	X			
Resources	Resource Movement Outside of Area of Operations	Aircraft Real Life Event				X	X	
		Personnel Real Life Event				X	X	
		Exercise Event						X

* Collateral damage levels 4 & 5 are included for training and reference purposes only and will not be exercised during RIMPAC 14

Table 1. RIMPAC 2014 delegation of authorities matrix

RIMPAC provided an excellent opportunity to refine the ATF/AEW construct. This article focuses on the coalition operational level, specifically the CFACC and CAOC. In preparing for the RIMPAC deployment, all Canadian Forces Taskings, Plans and Operations (CFTPO) candidates were assessed according to their background and training at the operational level and at an air operations centre (AOC). There was a balance between senior and junior personnel, some with previous RIMPAC (tactical) experience. Approximately 50 per cent had taken the Tactical Command and Control Course (TCCC) or the Canadian Forces Aerospace Warfare Centre's (CFAWC's) Operations Command and Control Course (OCCC). This training, combined with real-life operational experience, permitted rapid transition to CAOC operations and instant credibility among the CAOC director, division chiefs as well as senior watch and combat officers.

Looking forward to RIMPAC 2016, it is important to highlight where the RCAF should concentrate when lobbying for additional positions and where RCAF courses can modify and update their content. RIMPAC 2014 conducted planning conferences through 2013 and in early 2014; the schedule included a planning conference and commander's conference in February 2014 as well as a final planning conference and STAFFEX event in April 2014. These events enabled the development of a concept of operations (CONOPS) for all components and provided table-top exercise serials so that exercise plans and documentation could be finalized prior to the exercise. They also initiated the relationship-building and networking processes.

Several observations were drawn from these activities and were confirmed/validated during the exercise. First, during the planning conference in February 2014, it was identified by CF188 planners that access to F-22 debriefs at the Hawaiian Air National Guard unit would have been of great training value. This was raised to Canadian Armed Forces (CAF) leadership appointed to RIMPAC, and a concerted effort commenced to enable access. Initial correspondence showed positive results; however, security-clearance issues and operations-security (OPSEC) concerns were raised by US agencies. They had determined that there was insufficient time to screen and grant clearances within operational risk tolerances. Should access to F-22 debriefs be determined to be of value for RIMPAC 2016, it is recommended that access and clearance requirements be communicated and pursued in collaboration with exercise planners at the earliest opportunity. Planning for RIMPAC 2016 commenced in the Fall of 2014.

The importance of area air defence, especially given the responsibilities and accountabilities designated to the CFACC as AADC, cannot be understated. RCAF personnel preparing for AOC duties on operations and/or exercises should have a better awareness and understanding of this capability, especially so in a multinational setting. Training in area air defence and airspace control should be provided during the CFAWC's OCCC and the TCCC.



CAF/Photo
Colonel Lowthian, second from the left, discussing an operational issue with his counterparts at the RIMPAC 2014 CAOC

RIMPAC is a maritime-centric exercise and, as such, the Combined Forces Maritime Component Commander was normally the supported commander during the exercise. That said, the CFACC was always the supported commander for personnel recovery events; this is consistent with published AOC doctrine. Whether an individual falls overboard on a ship, is lost in the jungle or ejects from an aircraft, the CFACC is the supported commander. The recovery is coordinated and controlled by the

personnel recovery coordination centre (PRCC) within the CAOC. This is the case for opposed and unopposed recoveries (i.e., combat search and rescue [CSAR] and search and rescue [SAR]). Although the RCAF does not conduct CSAR, RCAF personnel will likely work within a CAOC where this function is assigned to the CFACC. RCAF personnel should have some understanding of the capability and coordination requirements. An introduction to joint personnel recovery and its doctrine should be provided to RCAF personnel during the CFAWC OCCC.


One key element to the success of RIMPAC is the unclassified (UNCLAS) nature of the exercise. This permits participation by numerous countries and also allows lessons learned and best practices to be documented, openly released and shared. During UNCLAS exercises, the US military routinely employs rules of engagement (ROE) drawn from the San Remo ROE open-source document. The San Remo ROE were employed during the STAFFEX in April and were discussed in detail by designated commanders and legal advisors during the build-up to RIMPAC. Although the ROE are generic, they serve as an excellent tool to commence the conversation and relationship between commanders and their legal advisors; they also serve as a basis for initial planning and CONOPS development. It is recommended San Remo ROE be incorporated into RCAF and CAF operational-level courses. The manual is an invaluable resource for establishing early lessons and discussions on ROE and the Law of Armed Conflict.

As stated, the CFACC and the CAOC serve as supporting elements to the maritime campaign during RIMPAC; therefore, the Combat Operations and Plans divisions are the focus of the CAOC. Other divisions within the CAOC, such as ISR, Air Mobility and Strategy Plans are given less significance and are represented by a relatively small number of personnel. It is anticipated that the ISR, Air Mobility and Strategy Plans divisions may grow in future RIMPAC exercises, given the increased play they received and the manner in which they were relied upon during RIMPAC 2014. The Strategy Planning Division and the Targeting Effects Team represent two excellent opportunities where the RCAF can cultivate expertise in operational-design and targeting-cycle practices. The RCAF had one officer in the Strategy Planning Division and no personnel on the Targeting Effects Team. Both sections provide outstanding opportunities for developing the skills and thought processes where grand strategy and operational intent are translated into tactical effects. The RCAF should campaign for more positions within the Strategy Planning Division and the Targeting Effects Team for RIMPAC 2016. Targeting working groups and boards should be included in the CFAWC OCCC, as these processes apply to both coalition and national interests.

RIMPAC 2014 once again demonstrated the trust and credibility that Canada has earned within multinational circles. The Deputy CFACC position was of exceptional value and should be alternated with the CFACC position. Additionally, the RCAF provided a while-so-employed (WSE) colonel for one of the CAOC director positions; this worked very well and was ultimately necessary. All three CAOC directors and their deputies were ranked at colonel or naval captain. Had the RCAF sent a lieutenant-colonel instead of a WSE colonel, it would have impacted the individual's ability to perform credibly in the multinational setting. The RCAF should actively pursue the CFACC position for RIMPAC 2016; if this is not possible, the Deputy CFACC position should be secured again. Senior positions within the multinational CAOC should be filled according to the rank specified; if this is not possible, a WSE promotion for the duration of the exercise should be supported.

RIMPAC provided an excellent opportunity to refine the ATF/AEW construct and to exercise C2 in accordance with doctrine. As the RCAF continues to build upon this process (through humanitarian operations, deliberate operations and working groups), exercises such as RIMPAC are central to our ability to validate operational doctrine in a multinational, multidisciplinary environment. RCAF lead planners for all exercises should clearly understand the importance of command-level emphasis on

the requirement to evolve and mature RCAF C2 doctrine during their respective exercises; this should be highlighted when they receive 1 Canadian Air Division planning guidance.

Our matured contribution to RIMPAC has given the RCAF instant credibility and has allowed our leaders and planners to work seamlessly in a combined environment. As we look toward the future, we should focus on our training by integrating our tactical- and operational-level courses in order to maximize our lessons learned and best practices. 

Colonel David Lothian is a transport pilot with time on the CC130 Hercules and CC177 Globemaster. He is currently serving as the Wing Commander, 8 Wing.

Abbreviations

AADC	area air defence commander
AADP	area air defence plan
ACA	airspace control authority
ACO	airspace control order
ACP	airspace control plan
AEW	air expeditionary wing
AOC	air operations centre
ATF	air task force
ATO	air tasking order
C2	command and control
CAF	Canadian Armed Forces
CAOC	combined air operations centre
CAOP	combined air operations plan
CCO	chief of combat operations
CCTF	commander combined task force
CFACC	combined force air component commander
CFAWC	Canadian Forces Aerospace Warfare Centre
CFMCC	combined force maritime component commander
Comms	communications
CONOPS	concept of operations
CSAR	combat search and rescue
Dir	director
HPTL	high pay-off target list
HVTL	high-value target list
ISR	intelligence, surveillance and reconnaissance
JPTL	joint prioritized target list
MAAP	master air attack plan
OSCC	Operations Command and Control Course
OPP	operational planning process
ORM	operational risk management
PR	personnel recovery

RCAF	Royal Canadian Air Force
RIMPAC	rim of the Pacific
ROE	rules of engagement
SITREP	situation report
SPINS	special instructions
STAFFEX	staff exercise
TCCC	Tactical Command and Control Course
TST	time-sensitive targeting
UNCLAS	unclassified
US	United States
WSE	while so employed

Notes

1. Note that technical connectivity between services (such as the US Navy and Marine Corps) as well as coalition partners was initially a challenge. These difficulties were overcome during the Force Integration Phase.

2. These responsibilities and our understanding of them cannot be overlooked, even if we do not practice some of them within RCAF doctrine or mission sets. We have to at least have some basic knowledge of military space so that RCAF personnel selected to these positions can act and decide in a credible fashion.



CAF Photo

Canadians who worked within the CAOC and filled staff positions during RIMPAC 2014



Integrating Space^{into} Canadian Armed Forces Operations

By Captain Richard Moulton



Introduction

Although the Canadian Space Operations Cell (CANSpOC) has existed since September 2012, its two deployable joint space support teams (JSSTs) have developed only initial procedures to date. The basic deployment framework was established during JOINTEX 13 (Joint Exercise) and, in August 2014, the JSSTs were sent on further exercises in order to continue building the framework into a more robust set of procedures.

It was especially valuable during these exercises to see how the United States Air Force (USAF) operates as the lead American military service for coordinating space support and effects in a given theatre. At the operational level, USAF integrates space into the air operations center (AOC), the command and control (C2) structure used to direct aerospace forces operating independently as well as in joint or combined environments. The main method by which this is done is through the appointment of a director of space forces (DIRSPACEFOR), as codified in Air Force Instruction 13-1 (AOC), Volume 3, *Operational Procedures – Air Operations Center (AOC)*.

The concept of a director of space forces

In the American model (see Figure 1), the overarching authority for space in a theatre is the space coordination authority (SCA). The SCA, a role which the joint force commander (JFC) may decide to retain or delegate to a subordinate, is responsible for “joint space operations planning, to include ascertaining space requirements within the joint force.”¹ It is a role similar to other theatre functions such as the area air defence commander (AADC) or airspace control authority (ACA), all of which may be delegated by the JFC to the joint force air component commander (JFACC) / combined force air component commander (CFACC) and integrated into the latter’s staff. Regardless of who is designated as the SCA, a joint space element is encouraged to aid in the execution of day-to-day responsibilities.² When the JFACC/CFACC is designated the SCA, the DIRSPACEFOR will typically lead the joint space element in support of these responsibilities.

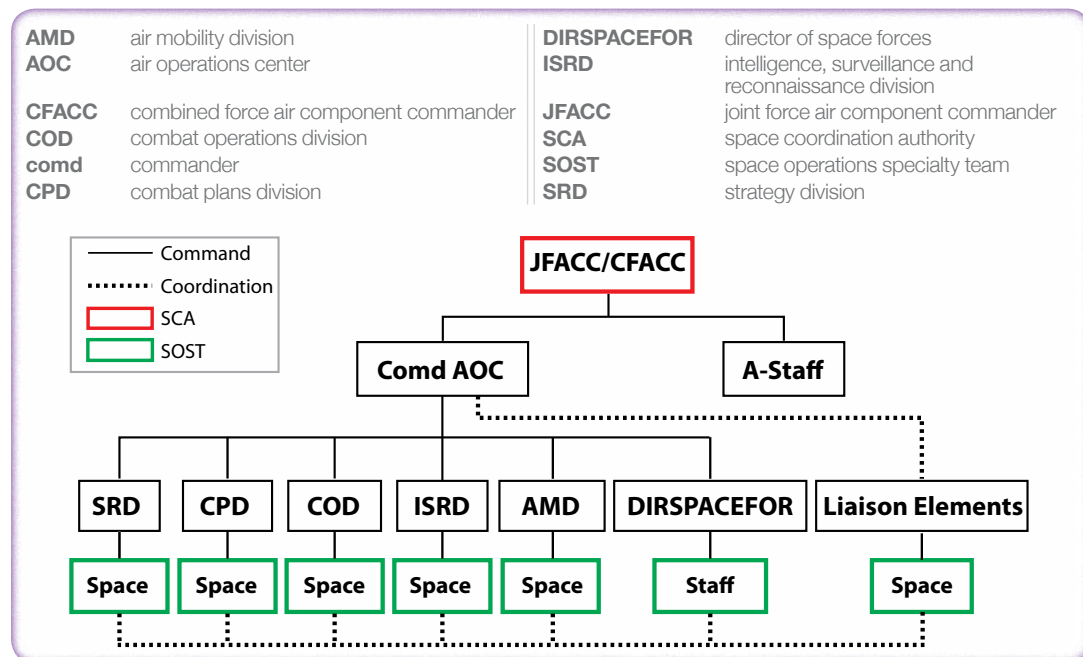


Figure 1. DIRSPACEFOR in an American AOC

Within the AOC, the DIRSPACEFOR is “the senior space advisor to the JFACC with broad space expertise, [with] theater familiarity, and who provides advice on the planning, executing, and assessing of USAF space operations.”³ As part of this role, the DIRSPACEFOR “facilitates coordination, integration, and staffing activities on behalf of the JFACC to include providing support for joint space operations to the SCA.”⁴ They are supported in these activities by a group of specialists called the space operations specialty team (SOST).⁵

The SOST is made up of two components. The first consists of augmentees to the five AOC divisions: strategy;⁶ combat plans;⁷ combat operations;⁸ intelligence, surveillance and reconnaissance;⁹ and air mobility.¹⁰ These positions integrate space effects and support throughout the planning and execution phases and provide their respective divisions with space subject matter expertise. While these augmentees are responsible to their respective division chiefs, their efforts are also coordinated by the second component of the SOST: the DIRSPACEFOR staff. This ensures that space support is deconflicted and rationalized across the AOC and that the necessary information is available to the DIRSPACEFOR for their situational awareness when advising the JFACC on their role as SCA.

The SOST fulfills its role as the joint space element by coordinating space support provided to the other components via the various component liaisons embedded at the AOC.¹¹ Each of these component liaisons, such as the battlefield coordination detachment or the naval and amphibious liaison element, work for their respective component commanders (comds) and will designate members to liaise with the SOST. Similar support can be provided to allies in a combined environment through coalition and allied liaison officers.¹²

The effect of implementing the American model is that space is integrated into all parts of the operational planning process for the entire joint force. Space subject matter experts (SMEs) are clearly identified and assigned throughout the AOC; both friendly space capabilities and adversary space threats are understood and given the proper consideration when planning and conducting operations. Furthermore, the needs of all services and allies are integrated. At a higher level, the DIRSPACEFOR is the one authority who briefs the JFACC/CFACC in the latter’s role as SCA, and the SCA is the one authority for integrating space capabilities in support of the JFC’s campaign.¹³

The Canadian context

Although USAF has a long history of working to develop space capabilities and integrate them into aerospace and joint operations, there are enough differences between the structure of American military forces and that of the Canadian Armed Forces (CAF) that a recommendation to adopt the American model wholesale is neither realistic nor responsible. Analysing this model should, however, be the starting point of any attempt to integrate space into CAF operations. There are three points to consider when reshaping American doctrine for Canadian use.

The first point is that USAF has primacy in the space domain for the American military forces, and similarly, Royal Canadian Air Force (RCAF) doctrine defines aerospace power as “that element of military power applied within or from the air and space environments.”¹⁴ Associating air and space power in this manner is natural, as they share many characteristics such as elevation, fragility, reach, sensitivity to technology and stealth.¹⁵ Beyond these basic premises, however, while the USAF’s 14th Air Force is responsible for operating the Joint Space Operations Center (JSpOC),¹⁶ providing 24-hour C2 of all space operations forces,¹⁷ the CAF’s CANSpOC is a joint operational unit within Director General Space (DG Space) under the Vice Chief of the Defence Staff (VCDS). Given that support provided through space is inherently a joint effect, this presents an opportunity to institutionalize the CAF’s view of space as a joint capability and situate it with the JFC and the joint task force headquarters (JTF HQ), as a part of the special staff described in CFJP 3.0, *Operations*.¹⁸

The second point is that in American military doctrine, the Comd Joint Functional Component Command for Space (JFCC Space) is designated as the global space coordinating authority (GSCA),¹⁹ while in Canada there is no such authority. Along the same lines, Comd JFCC Space is supported by a large space cadre, including the JSpOC and each of the geographic combatant commanders’ (GCC) DIRSPACEFORs. DG Space, on the other hand, has only the CANSpOC along with the projects and policies sections of the DG Space organization working to advance the integration of space into CAF operations. These two differences represent a clear gap in both the authority and ability to embed space into the respective military forces. Addressing this gap, it has been proposed that DG Space fulfill the GSCA role by acting as the Comd Joint Space Component Command (JSCC) for Comd Canadian Joint Operations Command (CJOC). This role would be a single authority for operational space and would institutionalize space as a joint capability in the CAF.

The third point is that while American military doctrine has Comd United States Strategic Command supporting the various GCCs by allowing applicable components (i.e., JFCC Space) to coordinate with the SCA,²⁰ the CAF does not have a similar structure of GCCs. Instead, CJOC is responsible for CAF operations not conducted solely by North American Aerospace Defence Command (NORAD) or Canadian Forces Special Operations Forces Command (CANSOFCOM).²¹ This difference in the scale of operations and span of control seen with the American military services and the CAF is a factor to be accommodated going forward.

A CAF model for space

The suggested model for integrating space into CAF operations takes into account these three points. It includes three levels of space expertise: the SCA, the DIRSPACEFOR and space SMEs integrated into tactical and operational levels of planning. While these concepts mirror the USAF model, modifications to it recognize the differences between the American military services and the CAF, while allowing for the tailored integration of space support into operations. These operations range from the steady state, to a CAF task force (TF) working with American forces, to a CAF TF operating independently.

As shown in Figure 2, in the steady state, space C2 for the CAF sees DG Space in their role as Comd JSCC executing the role of GSCA for Comd CJOC in support of the latter’s operations in a global area of responsibility (AOR). The Director of Space Operations and Readiness (DSO&R), leading

the CANSpOC, acts as the DIRSPACEFOR while the CANSpOC provides the expertise required to integrate space into operational-level planning across the staff system at CJOC and pushes space-force-enhancement products and analysis to the headquarters and operations subordinate to CJOC.

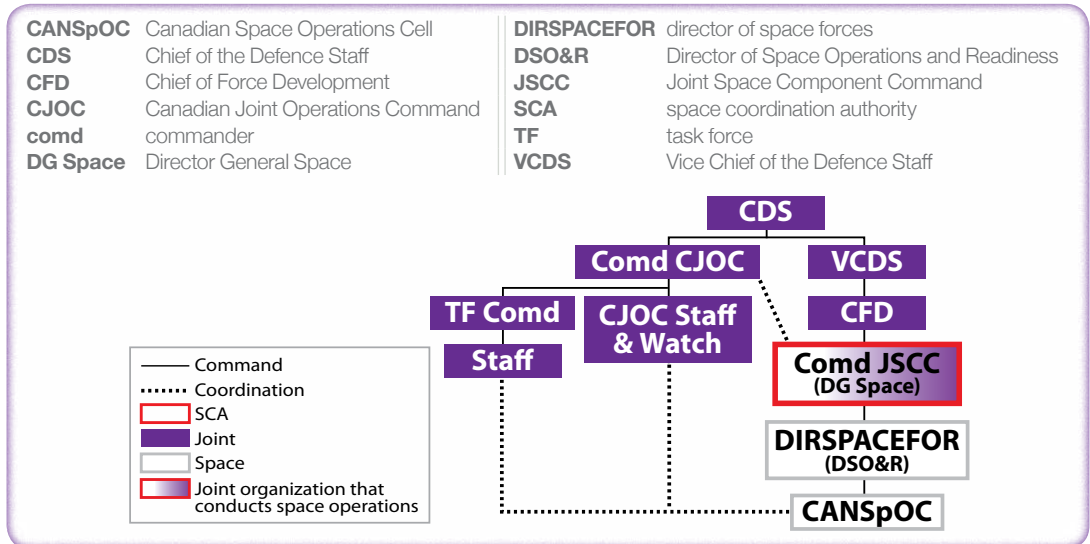


Figure 2. CAF Steady State

The next scenario (see Figure 3) consists of a CAF TF, joint or otherwise, deployed and acting in concert with American forces. While Comd JSCC, through the DSO&R/DIRSPACEFOR and the CANSpOC, continues to provide space expertise and integration to Comd CJOC, a deployable JSST is sent as part of the CAF TF HQ. The three roles performed by the JSST are to integrate space into the TF comd's battle rhythm, provide reachback to the capabilities provided by CANSpOC and liaise with the appropriate GCC's DIRSPACEFOR staff to ensure that the TF's space requirements are properly integrated at the theatre level in the combined environment.

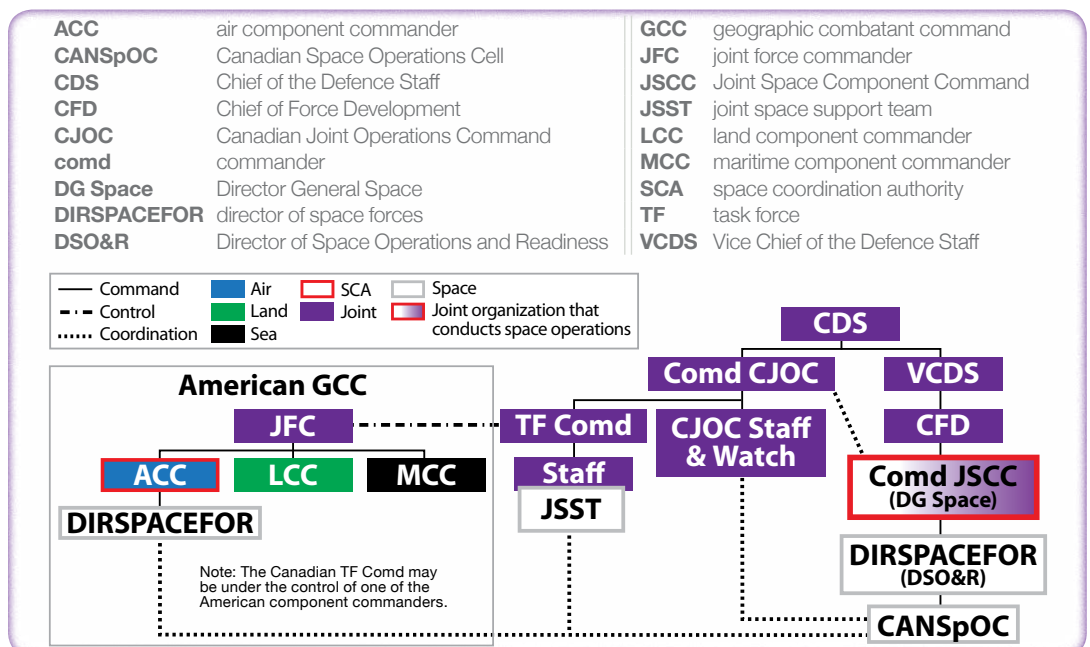


Figure 3. CAF TF integrated with American force

In the third scenario (see Figure 4), a CAF JTF operates independently; the same level of support is provided by Comd JSCC, the CANSpOC and JSSTs. The option exists, however, for Comd JSCC to delegate SCA for the JFC's AOR to the JFC. At this point, additional JSST and CAF space cadre personnel are also deployed to augment any space expertise at JTF HQ and act as the JFC's DIRSPACEFOR and staff. As in the USAF model, the DIRSPACEFOR coordinates all space requirements across the components, deconflicts space support requests and provides a coherent picture of space integration to the JFC and back to Comd JSCC.

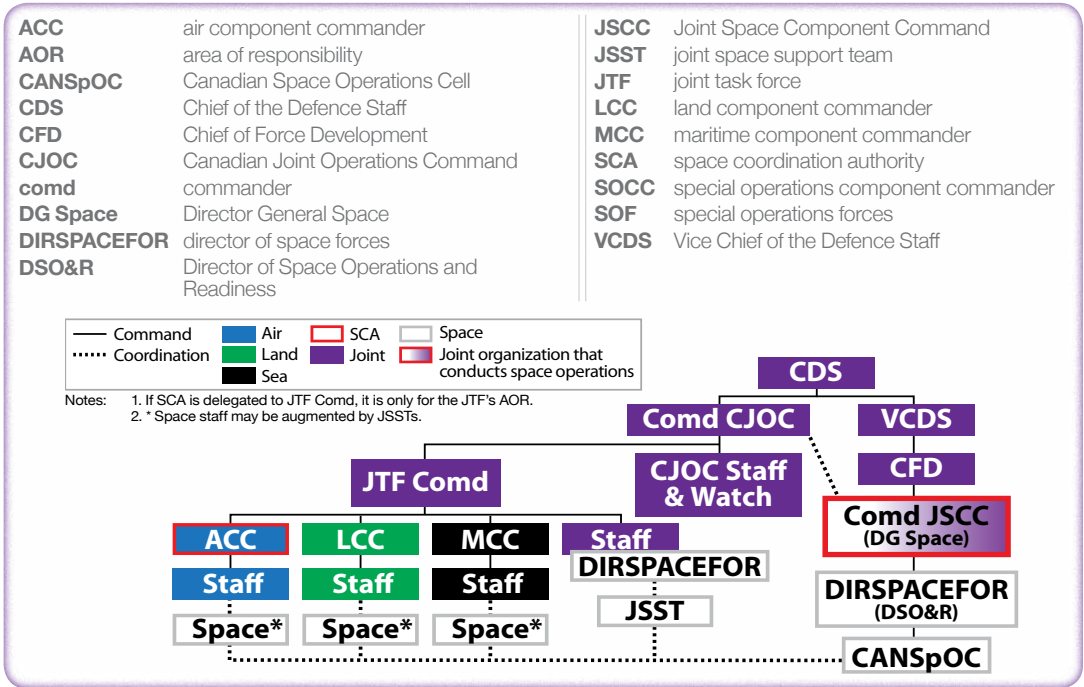


Figure 4. CAF JTF operating independently

Conclusion

The JSSTs represent the next step in developing space expertise that can be integrated into CAF operations. This model, and its three levels of integration, provides the CAF space cadre with a guide for this next step. As the CANSpOC and its JSSTs continue to develop the support and expertise they provide, integration into the operational-level headquarters conducting operations will be increasingly important.

Crucially, the CANSpOC, JSST team members and headquarters staff must draw on the experience of our American allies as we continue this development in order to seek out best practices and avoid repeating mistakes. The USAF doctrine of a DIRSPACEFOR and staff is a proven one that the CAF's space cadre should adopt when integrating into an operational-level headquarters at any tempo of operations. The DIRSPACEFOR best represents space on a JFC's staff and ensures that space effects and support are integrated appropriately into the planning and execution phases of the JFC's campaign.

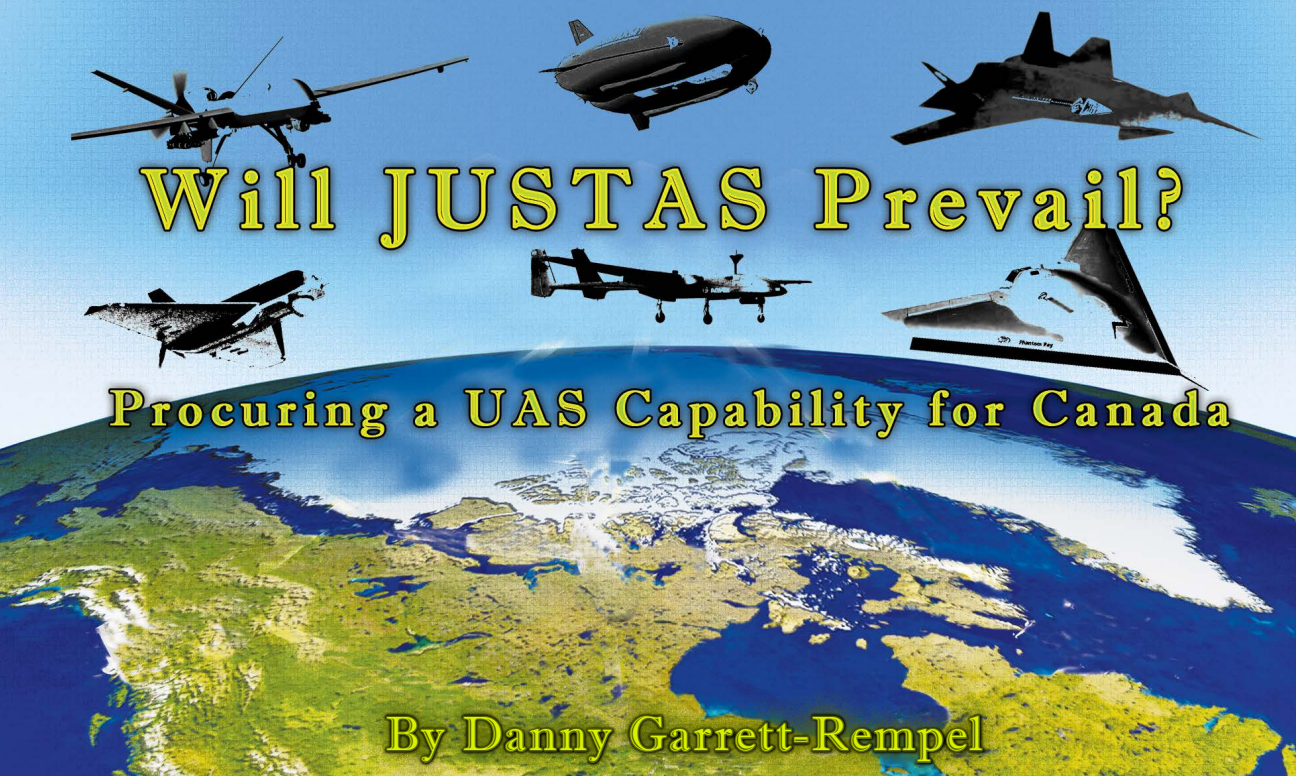
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Abbreviations

AFI13-1AOCV3	Air Force Instruction 13-1 AOC, Volume 3, <i>Operational Procedures – Air Operations Centre (AOC)</i>
AOR	area of responsibility
comd	commander
ACC	air component commander
AMD	air mobility division
AOC	air operations center
C2	command and control
CAF	Canadian Armed Forces
HQ	headquarters
CANSpOC	Canadian Space Operations Cell
CDS	Chief of the Defence Staff
CFACC	combined force air component commander
CFD	Chief of Force Development
CJOC	Canadian Joint Operations Command
COD	combat operations division
CPD	combat plans division
DG Space	Director General Space
DIRSPACEFOR	director of space forces
DSO&R	Director of Space Operations and Readiness
GCC	geographic combatant command
GSCA	global space coordination authority
ISR	intelligence, surveillance and reconnaissance division
JFACC	joint force air component commander
JFC	joint force commander
JFCC Space	Joint Functional Component Command for Space
JSCC	Joint Space Component Command
JSpOC	Joint Space Operations Center
JSST	joint space support team
JTF	joint task force
LCC	land component commander
MCC	maritime component commander
RCAF	Royal Canadian Air Force
SCA	space coordination authority
SOCC	special operations component commander
SME	subject matter expert
SOF	special operations forces
SOST	space operations specialty team
SRD	strategy division
TF	task force
US	United States
USAF	United States Air Force
VCDS	Vice Chief of the Defence Staff

Notes

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Will JUSTAS Prevail?

Procuring a UAS Capability for Canada

By Danny Garrett-Rempel

Editor's note: At various times, the Canadian Armed Forces has referred to these types of aircraft as drones, uninhabited air vehicles, unmanned air vehicles, unmanned aircraft, unmanned aircraft systems and remotely piloted vehicles. To avoid confusion, for the purposes of this article, the current label of unmanned aircraft system (UAS) will be used.

Introduction

Canada has experience both commercially designing and operating UASs. The Canadian Armed Forces (CAF) operated a variety of UASs in Afghanistan as part of the North Atlantic Treaty Organization's (NATO's) International Security Assistance Force (ISAF). The effectiveness of UASs as a platform led to the creation of the Joint Unmanned Surveillance and Target Acquisition System (JUSTAS) programme in the early 2000s, in order to facilitate Canada's process of procuring its own cutting-edge UAS capability. Given the advanced state of UAS technology, the history of Canadian UAS design and operation, and the demonstrated utility of UASs on the battlefields of Afghanistan, it comes as a surprise that Canada has yet to procure a permanent UAS capability through the JUSTAS programme. This article will examine the history of UAS design in Canada, the procurement processes undertaken for UASs deployed to Afghanistan, the JUSTAS programme and future roles that UASs may be expected to play as an asset of the CAF. It will also explore a number of issues that may be delaying a successful UAS procurement under the JUSTAS programme.

Canadian-designed UASs

Canada has a long history of designing and developing UASs. The very first UAS to be designed in Canada was a cooperative project between the Canadian and British governments.¹ In the early 1960s, Canadair led the design and testing of the CL-89, a recoverable missile that was capable of performing surveillance missions.² The CL-89 operated as a drone; its flight path was preprogrammed, and its mission was carried out without further human input. Launched from truck-mounted rails,

the main drone craft would detach from its booster, and once it reached flight speed, a turbojet would take over for the remainder of its flight. Upon completing its mission, the drone would return to a predetermined recovery site, reaching the ground safely using parachutes. An operator collected its surveillance material, and the drone could be reset for future missions. In 1985, Canada, France and West Germany signed a memorandum of understanding for an updated version: the CL-289.³ The British army deployed the original version, the CL-89 (which they nicknamed “the Midge”), in the First Gulf War in 1991, while German and French forces deployed the updated version, the CL-289, over the Balkans in the late 1990s.⁴

In the 1970s and 1980s, Canadair tested the CL-227. Nicknamed “the Peanut” due to its hourglass shape, the CL-227 was a contra-rotating blade helicopter UAS. It could be fitted with surveillance or weapon suites, depending on its mission profile. Its vertical take-off and landing (VTOL) capability made it ideal for missions that involved loitering above a target for an extended period of time. It was also capable of shipborne launch and was tested aboard United States (US) Coast Guard and Navy vessels.⁵ Bombardier, which had acquired Canadair in 1986, developed a more advanced version of the CL-227 in the 1990s: the CL-327 Guardian. The latest version, the CL-427 Puma, underwent trial testing in 2001.⁶

Despite being designed and built by Canadian industry, the CL-289 was not purchased by the CAF. It was sold to and deployed by several NATO countries, but its purchase by Canada was scrapped due to cuts to the 1990 defence budget.⁷ Moreover, as of 2008, there were no known customers operating the CL-327 Guardian.⁸ Canadian firms were recognized as leaders in the field of developing state-of-the-art UASs from the 1960s until the 1980s, but a lack of government procurement contracts meant that the technology declined in Canada from the 1980s until the early 2000s.⁹ The implication this holds for the JUSTAS programme is that even if Canadian industry proves capable of providing an appropriate UAS platform for consideration by the JUSTAS programme, there is no guarantee that the Canadian government will purchase it.

Deployment to Afghanistan

Canada’s most recent association with UASs has been in an operational capacity on the battlefields of Afghanistan. Canada was one of the first nations to contribute troops to Operation ENDURING FREEDOM, having deployed Air Force personnel and members of Joint Task Force Two (JTF 2) to Afghanistan in 2001 as part of Canada’s Operation APOLLO. Soldiers from Canada’s Princess Patricia’s Canadian Light Infantry also took part in fighting against Taliban and al-Qaeda forces in the Shah-i-Kot valley under Operation ANACONDA in 2002.¹⁰ The CAF officially joined NATO’s Kabul-based ISAF mission in 2003. To support Canada’s ISAF mission in Kabul—Operation ATHENA—as well as to fulfill a commitment made to NATO to acquire a UAS capability by 2004, efforts were made by the Department of National Defence (DND) to procure UASs for the CAF.¹¹ The first UAS acquired, and operationally deployed by Canada, was the CU161 Sperwer.

In August 2003, the Government of Canada awarded the contract worth \$33.8 million for four Sperwer UASs to Oerlikon Contraves of Quebec, with the French company Société d’Applications Générales de l’Électricité et de la Mécanique (SAGEM) listed as the subcontractor.¹² AAI Corporation’s Shadow 200 tactical unmanned aircraft system (TUAS) was thought to be a frontrunner but was beat out by the Sperwer.¹³ The off-the-shelf procurement of these UASs serves as one of the first examples of an accelerated procurement process, which fell within the Agreement on Internal Trade Chapter 5 clause 506.11(a). This clause allows for the bypassing of competitive procurement processes “where an unforeseeable situation of urgency exists and the goods, services, or construction cannot be obtained in time by means of open procurement procedures.”¹⁴

The SAGEM Sperwer is a French-designed TUAS. It is capable of functioning at a range of 200 kilometres (km) from its ground control station, carrying an array of imaging sensors, while operating at an altitude of 4,876.8 metres (m) and can loiter for up to six hours.¹⁵ It is launched by a truck-mounted, pneumatic ram and recovered through the combined use of parachute and inflatable airbags.¹⁶ The Sperwer was meant to provide the CAF stationed in Kabul enhanced intelligence, surveillance, target acquisition and reconnaissance (ISTAR) capability. The Sperwer could collect high-resolution imagery day and night and could locate targets with an accuracy of 20 m.

The Sperwer gave the CAF its first opportunity to deploy UAS capabilities in an active theatre of combat operations, but it did not come without a learning curve. One soldier compared the Sperwer to a “kid’s remote-controlled plane with a camcorder taped to the bottom of it” and quipped that the only people who could not hear the Sperwer’s distinctive lawnmower sound as it flew overhead were the deaf.¹⁷ Aesthetics aside, as the Sperwer was nearing full operational capability in December 2003, its deployments became plagued by a series of technical and human-operator errors. In one instance, a faulty spring failed to deploy the landing parachute, causing a Sperwer UAS to glide into the ground.¹⁸ In January 2004, a UAS operator dropped the altitude on the Sperwer too early, causing it to careen into a hill. The crash of a sixth Sperwer resulted in a disruption of the CAF’s UAS capability. It was not until December 2005, following the CAF’s deployment to Kandahar, that DND purchased five additional Sperwers at a cost of \$15 million.¹⁹ These were delivered in 2006.

The CAF also deployed a number of micro or miniature unmanned aircraft systems (MUASs), small unmanned aircraft systems (SUASs) and TUASs in Afghanistan. The Army operated the Scan Eagle, a 20-kilogram (kg) catapult-launched UAS made by Boeing subsidiary Insitu.²⁰ It has a top speed of 150 kilometres/hour (km/h), a flight time of 20 hours and a range of 100 km. The Scan Eagle logged more than 30,000 hours of flight time in Afghanistan.²¹ Under a deal worth \$2.9 million for five units, US Company Prioria Robotics supplied ground forces with its Maveric MUAS.²² It ran on a lithium polymer battery, similar to that of a laptop, and weighed approximately one kg. The Maveric’s size and foldable wings allowed it to be rolled up and stowed inside a tube after use.²³ With a flight time of 30 minutes and a range of 10 km, the Maveric was instrumental in providing tactical awareness to units on the ground via video stream to an operator’s laptop. To support Canada’s deployment to Kandahar, Thales Canada and Elbit Systems of Israel provided the Skylark-I SUAS. Hand launched, the Skylark-I provided tactical surveillance and reconnaissance for Operation ARCHER.²⁴

Incidents with the Sperwer notwithstanding, the operational and strategic value of ISTAR capabilities that larger, long-endurance UASs could provide was clear to the CAF. As the Canadian mission in Afghanistan expanded, a greater UAS capability was required. In order to address an operational shortfall, the CAF created the Joint Airborne Intelligence, Surveillance, Reconnaissance Capability (JAIC) project. In July 2007, a letter of interest (LOI) was submitted to industry, seeking a UAS platform capable of supporting a broad spectrum of activities from tactical-level engagements, involving CAF Land and special operations forces, to theatre-level intelligence assessments.²⁵ In 2007, an independent non-partisan committee was appointed by Prime Minister Stephen Harper to review Canada’s mission in Afghanistan. The committee’s final report, entitled *The Independent Panel on Canada’s Future Role in Afghanistan* (also known as “the Manley Report,” after Chairman John Manley), was delivered in 2008 and called for the government to secure high-performance UASs with intelligence, surveillance and reconnaissance (ISR) capability.²⁶ To fulfill the Manley Report’s recommendations, Project Noctua—a competitive procurement process worked on jointly by Public Works and Government Services Canada (PWGSC) and DND—superseded the JAIC project. The intention was to lease long-endurance UASs equipped with electro-optic/infrared (EO/IR) payloads suitable for overland ISR missions.²⁷

The platform selected to replace the Sperwer was the CUI70 Heron. MacDonald, Dettwiler and Associates (MDA) and its Israeli partner, Israel Aerospace Industries, were awarded the \$95-million contract which provided for a two-year lease of three Heron UASs with a \$35-million option for a third year.²⁸ Under the terms of the contract, MDA was responsible for training on as well as maintenance and logistical support of the Heron, while the Air Force (under Task Force Erebus) deployed and operated the Heron from Kandahar Airfield.²⁹ Project Noctua is notable for evolving from its initial conception to contract award in a mere nine months.³⁰ Moreover, only five months passed between the awarding of the contract and the deployment of the Heron.³¹ The success of Project Noctua can be attributed to basing it on off-the-shelf technology and effectively integrating government and industry throughout each stage of the process.³²

The CUI70 Heron is a medium-altitude long-endurance (MALE) UAS with a service ceiling of 9,144 m, endurance in excess of 24 hours, and day or night operational capability. The Heron can reach speeds in excess of 200 km/h. The CAF variant of the Heron utilizes a line-of-sight control system that supports operations at a range of 200 km.³³ The Heron, unlike the Sperwer, is launched and recovered from a runway; advanced models are capable of automatic launch and recovery. The Heron was first deployed to Afghanistan in January 2009, shortly before the last flight of the Sperwer, which was retired in April 2009 after 1,300 missions and 4,300 operating hours.³⁴ With a carrying capacity of 250 kg, the Heron payloads included an EO/IR turret, electronic warfare systems, and both overland and a synthetic aperture radar.³⁵ According to the Royal Canadian Air Force (RCAF), its primary function was to “provide lifesaving surveillance and intelligence gathering capabilities that can be used in a variety of operations ... [and to] help save lives by reducing the threats to soldiers on the ground.”³⁶ Coinciding with the drawdown of Canadian Forces in Afghanistan following the end of Canada’s combat mission in 2011, Heron UAS operations came to a close.

With the end of Canada’s training assistance to the Afghan National Police and the Afghan National Army (Operation ATTENTION), Canada’s overall mission in Afghanistan came to a close in March 2014. A flag-lowering ceremony in Kabul and the withdrawal of the final 84 soldiers from the country marked the end of Canada’s 12-year contribution to ISAF. One clear result of Canada’s deployment to Afghanistan is the positive contribution and value that a UAS capability provided the CAF. The smaller MUAS, SUAS or TUAS (like the Scan Eagle, Maveric and Skylark), the large TUAS (like the Sperwer) and the MALE UAS (like the Heron) all contributed to the safety and success of the CAF by acting as a force multiplier that supplied crucial around-the-clock ISR capability. The JUSTAS programme is meant to procure a UAS that can provide the CAF with this capability on a permanent basis.

The JUSTAS programme

The ability to deploy an asset capable of staying on task for an extended period, while carrying out either an ISR function or a targeted strike, all without putting a pilot’s life at risk, makes a UAS valuable to militaries as a low-risk force multiplier. The benefits derived from UASs may account for the rapid expansion of their use. The US Department of Defense, for example, has increased the number of UASs in service from 167 in 2002 to nearly 7,500 in 2010. In 2012, 76 countries were operating UASs, and an additional 50 countries were developing their own platforms.³⁷ The integrated ISTAR capability of a UAS platform would provide the CAF much needed up-to-date capabilities that have become crucial in the age of network-centric warfare.³⁸

In September 2000, JUSTAS began as an experimental programme meant to facilitate Canada’s acquisition of UAS assets. Between 2002 and 2004, a number of trials were undertaken by the CAF using leased UASs to test the capabilities of various platforms. The Air Force, on behalf of the CAF, began work on JUSTAS in 2005, deciding in 2006 that the implementation of JUSTAS would follow

two phases: phase one was to cover an overland capability (non-maritime surveillance and overseas expeditions) while phase two would cover domestic maritime surveillance and patrols over the Arctic.³⁹ In 2008, steps were taken toward UAS procurement that included the release of the *Canada First* Defence Strategy, which earmarked nearly \$500 billion over the next 20 years for military procurement (including a UAS programme)⁴⁰ as well as a LOI by DND and PWGSC to industry.⁴¹

The long-term goal of the JUSTAS programme as outlined in a 2012 request for information (RFI) to industry is “to field and support interoperable, network-enabled Unmanned Aircraft Systems (UAS) to provide Intelligence, Surveillance, Reconnaissance (ISR), Target Acquisition, and all-weather precision strike capabilities in support of CAF operations worldwide.”⁴² The operational requirements for the UAS platforms to be procured through JUSTAS specify a Class III MALE UAS, capable of at least 1,852-km (1,000-nautical mile) ranges, 18 hours of endurance, the ability to conduct operations over land and sea (especially the Arctic), and the capacity to carry multiple payloads (both surveillance and strike packages).⁴³ However, a request for proposals meant to be released by the government in 2009 never materialized. Aircraft delivery deadlines in 2010 and 2012 came and went, while a 2017 delivery date has been pushed to sometime between 2021 and 2025.⁴⁴ To date, the JUSTAS programme has neither identified a UAS platform nor awarded a contract.⁴⁵ While the PWGSC’s February 2014 announcement of a new Defence procurement strategy for Canada may be a cause for cautious optimism when it comes to the future procurement of a UAS for Canada, the JUSTAS programme continues to languish in the options analysis phase.⁴⁶

Possible application of UASs by the CAF

As climate change continues to alter both the ice cover and the geopolitical landscape of the Arctic, it will become increasingly important for Canada to strengthen its domain awareness over its northern territory.⁴⁷ UASs are particularly suited to tasks that are dull, dirty and dangerous.⁴⁸ Low-intensity, time-consuming, persistent surveillance over the frigid expanse of Canada’s sparsely populated Arctic territory lends itself well to unmanned overflights, which would prevent the need for a pilot to be placed in harm’s way. A UAS capability could complement existing surveillance platforms in Canada’s Far North (such as RADARSAT, Northern Watch and long-range patrols carried out with CP140 Auroras) as well as support the Canadian Rangers, who provide valuable human intelligence (HUMINT) about Canada’s Arctic territory. UASs could also be used to fill gaps in existing forms of coverage with multispectral high-resolution imagery that modern UAS sensor suites can provide. The payload capacities of UASs are also being taken into consideration for their application to search-and-rescue (SAR) operations, particularly their potential for dropping SAR packages to assist rescue efforts in Canada’s North.⁴⁹

With the problems surrounding the F35 Joint Strike Fighter and Canada’s next-generation fighter procurement, some scholars have suggested procuring UASs as part of a mixed fleet for the RCAF. Michael Byers—who holds a Canada Research Chair in Global Politics and International Law and regularly contributes articles to *The Globe and Mail*, *The Toronto Star* and *Ottawa Citizen*—and Stewart Webb—who has written extensively on issues relating to Canadian military procurement—have both advocated for extending the life of Canada’s CF188 fleet, supplementing it with new fighter aircraft as needed and adding UASs to take on roles traditionally held by fighter-jets as unmanned aircraft technology continues to develop.⁵⁰ This proposal is currently unfeasible for a number of reasons. While UASs have demonstrated consistent value where ISTAR capabilities are concerned, it will be a number of decades before the technology reaches an air-to-air capability similar to that of modern piloted fighter aircraft.⁵¹ Moreover, any UAS is only as strong as the satellite links (which are not impervious to disruption or interception) that allow an operator to control it.⁵² UASs are the most capable when carrying out missions over uncontested airspace. However, there is no guarantee that any future overseas deployment by the CAF will be under such permissive conditions.

The CAF's experience operating UASs in Afghanistan highlights the importance of this capability for any future overseas deployment. Whether the CAF's next mission is combat oriented or for peacekeeping or humanitarian purposes, a UAS capability would be an essential asset. The United Nations (UN), for example, has recently deployed UASs as part of its peacekeeping missions. UASs are being flown over the Democratic Republic of the Congo (DRC) for surveillance and intelligence-gathering purposes. Martin Kobler, the leader of the UN mission in the DRC, explains: "We have a mandate here to neutralize armed groups—you can't do it without intelligence."⁵³ The UN has also expanded the use of UASs for surveillance purposes in its missions in Mali and the Central African Republic.⁵⁴ A JUSTAS procurement would ensure that Canada could provide its soldiers on the ground with consistent and reliable ISTAR capabilities. Former Defence Minister Peter MacKay, reflecting on the Canadian mission in Afghanistan, stated that, "in retrospect, we could have perhaps prepared our soldiers better through both equipment and training."⁵⁵ Procuring a national UAS capability through JUSTAS would be a great step forward in preparation for any future expeditions undertaken by the CAF.

Causes of delays to the JUSTAS programme

While the JUSTAS programme is presently stalled, it is not because of a lack of available UAS options. A number of UAS platforms have been put forward as suitable contenders. Northrop Grumman pitched a variant of its Block 30 RQ-4B Global Hawk UAS to the Harper Government.⁵⁶ The modified version—dubbed the Polar Hawk—would be capable of Arctic operations with adjustments made to its satellite communication system to cope with the region's intermittent coverage. Building upon lessons learned from the CAF's experience operating the Sperwer in Afghanistan's harsh climate, the Polar Hawk would be equipped with wing and engine anti-icing capability to deal with extreme conditions in the Arctic.⁵⁷ A fleet of three to five Polar Hawks could fully cover Canada's north. The proposed cost is between \$30 and \$50 million per aircraft. However, the price increases to \$215 million per aircraft when support systems are considered.⁵⁸

In 2007, the Air Force approached the federal cabinet with a request to sole-source purchase the Predator UAS from the US but was rejected due to political backlash over earlier approval of contracts for helicopters and heavy-lift aircraft outside of competitive bidding.⁵⁹ Despite the failure of this deal, General Atomics Aeronautical Systems Incorporated (GA-ASI) partnered with Offset Market Exchange (OMX), a web-based platform for the offset market in Canada, to strengthen its commitment to offering the Predator B and Predator C Avenger UASs as contenders for the JUSTAS programme.⁶⁰ Both the Global Hawk and the Predator have proven to be capable UASs and would perform well as either surveillance or strike platforms, respectively, depending upon the final requirements of the JUSTAS programme.

Rapid technological innovation in UAS development is also causing delays to procurement under the JUSTAS programme. Commander of the RCAF, Lieutenant-General Yvan Blondin, has said that, "if you commit yourself too early with a very expensive program, there are new ones coming in that are not far behind that will give you different capabilities and could be much cheaper."⁶¹ The RCAF's project director for JUSTAS, Major John Whalen, agrees with Blondin's assessment, noting that instead of a MALE versus a high-altitude long-endurance (HALE) capability, new technologies are beginning to blur the lines, which may better suit the capability that Canada is looking to acquire.⁶² While technology's rapid advancement may be seen to serve Canada's long-term interests, it is creating a "wait-and-see" approach that is delaying a timely procurement of a UAS capability.

Obstacles to UAS procurement

Related to the issue of delays to the JUSTAS programme are the obstacles to deploying them or operating them within Canada. Afghanistan provided an ideal operating environment for UASs: a permissive airspace, a lack of major infrastructure and a compliant populace. Such conditions

are not present in Canada. According to Section 602.41 of Transport Canada's Canadian Aviation Regulations, no person is able to operate a UAS without applying for and receiving a special flight operation certificate.⁶³ In the past, air traffic control regulations have proven to be stumbling blocks for UAS acquisition. The most recent example is Germany's cancellation of a one-billion Euro contract to acquire the Euro Hawk, a signals intelligence variant of the Global Hawk, due to concerns that the European Aviation Safety Agency would not certify them for use.⁶⁴

In 2011, the RCAF acknowledged the issues that may arise from flying drones over Canada's airspace but concluded that it did not need approval from either Transport Canada or NAV Canada to fly UASs.⁶⁵ The potential exists that any UAS procured under JUSTAS may include detect, sense and avoid (DSA) technology, which may mitigate some of the risks involved with flying UASs in commercial airspace. However, as the President of the Rideau Institute, Steven Staples, points out, "it is one thing to fly a drone over the desert of Afghanistan, but it's something else to fly them over Ottawa or Toronto."⁶⁶ Conditions in the Arctic may prove more conducive to UASs overflights than more populous areas of the country. Despite Transport Canada having recently clarified regulations for civilian UAS usage, with plans to create further guidelines in the future, regulatory and safety concerns will remain issues to consider as Canada pursues UASs for military applications.⁶⁷

Another important issue that must be taken into account is the attitudes of Canadians. UASs have made their way into the collective consciousness due to the media's coverage of targeted strikes by the US on suspected terrorists in countries like Afghanistan, Iraq, Pakistan and Yemen. These types of strikes are not universally popular. A 2012 survey conducted by the non-partisan, public-opinion, Pew Research Center indicated a strong international opposition to US drone strikes. In Europe, disapproval ratings of US drone strikes (in particular, France, Germany, Greece, Spain and Poland) exceeded 50 per cent.⁶⁸ Canada typically deploys with its allies; therefore, adopting a capability that receives such widespread disapproval from allied populations could prove a complicating factor in future coalition efforts. Former RCAF fighter pilot Fraser Holman sees the deployment of armed UASs as "inconsistent with Canadian values" and "find[s] it unlikely that we might wish to employ such weapons of precision intervention even if they might be available."⁶⁹ While surveillance missions will most likely be directed to maritime and Arctic operations, domestic UAS overflights of populated areas may also raise concerns among Canadian citizens regarding individual and collective privacy.⁷⁰

For nearly all large-scale Canadian military procurements, budget creep has been a complicating factor. The JUSTAS programme is no exception. Initially expected to cost \$500 million, more recent estimates have risen to between \$1 billion and \$1.5 billion.⁷¹ Along with the particular UAS platform, Canada will need to pay for the infrastructure to support it. This includes radio or satellite links to ground stations, data collection and processing centres as well as command and control systems for the UASs.⁷² Costs for personnel to staff the command and control infrastructure needed for a UAS capability must also be taken into consideration. The government has received estimates that it will require over 300 personnel in order to create a UAS squadron.⁷³ For a project that has yet to identify a platform or prime contractor and has no foreseeable completion date, it can be expected that costs will continue to rise as UAS technology and capabilities advance.

The lack of clarity over which branch of the CAF will own and operate UASs is a further obstacle to the success of JUSTAS. With advanced military technology like UASs, which represent joint technology relevant to two or more services, it can be difficult to draw clear lines between platforms and the capabilities they possess.⁷⁴ This can be clearly seen in the deployment of various UASs by different branches of the CAF in Afghanistan. Before JUSTAS can succeed, military planners need to better define how UASs will fit into the structure of the CAF and into future Canadian defence strategies.⁷⁵ Until this is done, the JUSTAS programme may simply exist as a solution seeking a problem.


Without a strong supporter from one of the branches of the military, willing to spend the necessary political capital to see the JUSTAS programme to completion, UAS procurement may languish indefinitely.

Conclusion

Canada has had a long history with UASs, beginning with the commercial design of the Canadair CL-89 Midge in the 1960s up to the deployment of the Sperwer and the final missions flown by the Heron in 2011. Despite the numerous functions of UASs (including Arctic and maritime surveillance, SAR and multirole functions in future overseas deployments), the JUSTAS programme has been stuck in the options-analysis phase since 2011. While the Defence acquisition guide has been updated to reflect recent progress on the JUSTAS programme, final delivery of a UAS is still not expected until between 2021 and 2025.⁷⁶ Canada's contribution to the fight against the Islamic State, dubbed Operation IMPACT⁷⁷—consisting of six CF188's, a CC150 Polaris air-to-air refuelling tanker, two CP140 Aurora surveillance aircraft and several hundred military personnel—may jump-start the JUSTAS programme as the need for increased ISR capability grows as the campaign continues. However, a similar urgent operational requirement, represented by Canada's contribution to the air campaign over Libya in 2011, failed to yield government approval for \$600 million to purchase armed drones.⁷⁸

The JUSTAS programme has experienced lengthy delays for several reasons. A number of suitable platforms exist, such as the Global Hawk or Predator, yet an attitude persists within the RCAF that a wait-and-see approach may be a valid strategy for procuring the most advanced UAS. As is common with most military procurements, the costs associated with the JUSTAS programme have continued to rise. But, perhaps the greatest obstacle to the JUSTAS programme is the lack of clarity over which branch of the CAF will own and operate the technology. JUSTAS is an RCAF programme, yet the technology and its capabilities encompass more than a single branch of the military. This may account for the JUSTAS programme's lack of a strong backer with the necessary political capital to see it through to completion.

Procuring UASs for use in Canada comes with its own host of complicating factors. Operating military UASs over populous areas such as the southern parts of Canada will provide a new challenge to both Transport Canada regulations and Canadian UAS operators. The national attitudes of Canadians will also be challenged if Canada opts to utilize the strike capabilities of UASs for targeted attacks. Even if Canada limits UASs to surveillance functions, the concerns of citizens over privacy are likely to be an issue.

Regardless of the complications and delays to the JUSTAS programme, UASs have become an essential tool for modern militaries. As past procurements in Canadian history have shown, the longer the procurement process drags on, the more politically vulnerable it becomes.⁷⁹ If the CAF is serious about procuring a long-term UAS capability, it needs to determine how this platform will fit within the framework of the individual environments of the CAF and will support the CAF's future operational requirements. While waiting for newer and more advanced UASs may seem like a wise option, the managers of the JUSTAS programme need to reap the benefits of its lengthy options-analysis phase and select a platform sooner rather than later. The scramble that took place to procure military hardware, including UASs, following the CAF deployment to Afghanistan should not be repeated in the future. Canada must push forward with the JUSTAS programme in order to ensure it has access to UAS capabilities when they are needed most. 

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Abbreviations

CAF	Canadian Armed Forces
DND	Department of National Defence
DRC	Democratic Republic of the Congo
EO/IR	electro-optic/infrared
GA-ASI	General Atomics Aeronautical Systems Incorporated
ISAF	International Security Assistance Force
ISR	intelligence, surveillance and reconnaissance
ISTAR	intelligence, surveillance, target acquisition and reconnaissance
JAIC	Joint Airborne Intelligence, Surveillance, Reconnaissance Capability
JUSTAS	Joint Unmanned Surveillance and Target Acquisition System
kg	kilogram
km	kilometre
km/h	kilometres/hour
LOI	letter of interest
m	metre
MALE	medium-altitude long-endurance
MDA	MacDonald, Dettwiler and Associates
MUAS	micro/miniature unmanned aircraft system
NATO	North Atlantic Treaty Organization
PWGSC	Public Works and Government Services Canada
RCAF	Royal Canadian Air Force
SAGEM	Société d'Applications Générales de l'Électricité et de la Mécanique
SAR	search and rescue
SUAS	small unmanned aircraft system
TUAS	tactical unmanned aircraft system
UAS	unmanned aircraft system
UN	United Nations
US	United States

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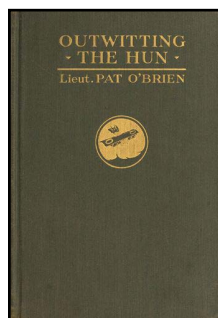
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BOOK REVIEWS



OUTWITTING THE HUN: MY ESCAPE FROM A GERMAN PRISON CAMP

By Lieut. Pat O'Brien

New York: Harper & Brothers Publishers, 1918

297 pages

<http://www.gutenberg.org/files/42490/42490-h/42490-h.htm>

Review by **Daniel J. Demers**

An American Pilot in the Royal Flying Corps

A number of websites have emerged which are digitizing public-domain books and articles for free use. The oldest of these is Project Gutenberg. Started in 1971, Project Gutenberg is a mostly volunteer archiving effort that relies on donations and contributions to operate. It and similar websites are exciting treasure troves of original-source material for military historians. Project Gutenberg has digitalized 47,542 books and is adding 50 more each week. One of its gems is Lieutenant Pat O'Brien's 1918 bestseller *Outwitting the Hun: My Escape from a German Prison Camp*.

In August 1917, O'Brien, an American pilot who joined the British Royal Flying Corps (RFC), was shot down over Belgium. A German bullet "went through my upper lip, came out of the roof of my mouth and lodged in my throat,"¹ he wrote. As his plane spiraled to the ground, he remembered saying over and over again to himself, "I'm killed, I'm killed."²

After recuperating in a field hospital, he was put on a train en route to a prisoner of war camp in Germany. As the train moved across Germany, O'Brien leaped out an open window, landing on rock ballast which closed "my left eye, skinning my hands and shins and straining my ankle ... [and] knocked [me] out."³

Bleeding profusely from his wounds, he began his 73-day trek to freedom. O'Brien hid during the day and walked at night—fording and swimming across numerous ditches, rivers, canals and streams. Starving, he subsisted on cabbage, sugar beets and carrots unearthed in farm fields during his night-time hikes. Crossing through Luxemburg and finally back into Belgium, he visited farmhouses begging for food. The farmers fed him at great risk; if found out, they would be executed for helping escaped prisoners.⁴

O'Brien had started flying in 1912—one of the so-called "early birds." For a time he flew for the United States Army's Air Corp during the Poncho Villa incursions across the Mexican border. Frustrated by America's reluctance to join Britain and France during the early days of World War I, he moved to Canada and volunteered for the RFC. In May of 1917, he and 17 other flyers were dispatched to England; 9 of the 17 were Americans like O'Brien.

A month later he was assigned to the "Pool Pilots' Mess," located in Flanders, Belgium. "Whenever a pilot was shot down or killed the Pool Pilots' Mess [was] notified to send another [pilot] to take his place,"⁵ wrote O'Brien. Soon the 27-year-old flyer was notified to report for a vacant scout pilot position. His new squadron was located 18 miles [30 kilometres (km)] behind the Ypres line. Scout pilots had no particular purpose other than to fly a thousand feet [305 metres (m)] higher than the "bomb droppers" and protect them. His duty was "just to fight, or, as the order was given to me, 'You are expected to pick fights and not wait until they come to you,'" O'Brien explained. The squadron's regular routine was to fly twice a day for two hours' duration.

On August 17, 1917, O'Brien shot down two German planes and was in turn shot down by anti-aircraft fire. He safely landed his aircraft close to his aerodrome, but artillery fire directed from German observation balloons completely demolished his craft while he hid in an artillery shell crater. He was picked up, driven to his headquarters and assigned a new aircraft; by evening, he was again on patrol, when he was shot down for the second time. He awoke in a German field hospital the following morning. In addition to the bullet wound in his mouth, he "had a swelling from my forehead to the back of my head ... I couldn't move an inch without suffering intense pain ..."⁷ O'Brien was told by German officers that he had plummeted "in a spinning nose dive from ... between eight and nine thousand feet [2,438.4 and 2,743.2 m], and they had the surprise of their lives when they discovered that I had not been dashed to pieces. They had to cut me out of my machine ..."⁸ The following day, several German fliers visited him and "treated me with great consideration,"⁹ he recalled. They presented him the red cap of the Bavarian pilot he had shot down, and he, in turn, acceded to their request that he give them one of his flying shoulder straps with his "star of rank" and also his RFC badges as souvenirs.¹⁰

After several weeks in the hospital, he was moved to a German prison camp at Courtrai, Belgium, where he remained three weeks. On September 9, he was placed on a train that was to take him to a prisoner of war camp at Strasburg, Germany.

The railcar, full of cigarette smoke, justified his feigning a coughing fit. He opened the window to exhaust the smoke. All the while the train was traveling between "thirty and thirty-fives miles an hour [48.3 and 56.3 kilometres per hour] ... as it rattled along over the ties,"¹¹ he wrote. O'Brien stood up on his bench seat "as if to put [my] bag on the [overhead] rack, and taking hold of the rack with my left hand and a strap that hung from the top of the car with my right, I pulled myself up, shoved my feet and legs out of the window, and let go!"¹² When he came to he realized "I was free and it was up to me now to make the most of my liberty."¹³

Bleeding profusely from his wounds caused by the fall from the train, he began his trek to freedom. He figured he spent nine days and nights traversing Germany before entering Luxemburg, which took him another nine days to cross. By the time he entered German-occupied Belgium, he was “in a very weak condition,” barely able to “cover more than five miles [8 km] a night.”¹⁴ On one occasion while swimming a river, he remembered choking and gasping. His “arms and legs were completely fagged out [exhausted]. ... I prayed for strength to make [the other side] ... I finally felt the welcome mud of bottom ...” O’Brien dragged himself up the bank grabbing grassy reeds of which “I could not retain my grip. I was afraid I would faint ... I kept pulling and crawling ... and finally made it.” There on the bank for the first time in his life he “fainted from utter exhaustion.”¹⁵

After about two months, O’Brien finally met up with Belgian insurgents who put him up in an abandoned house [in an unnamed city] with a forged passport. They later abandoned him after he refused to pay them for their help, leaving him to continue on his own. At night, he would “steal quietly out of the house to see what I could pick up in the way of food. ... I scoured the streets, the alleys, and the byways for scraps ...”¹⁶ On one occasion he stole a piece of stewed rabbit from a scavenging alley cat. Bored, he found an old copy of the *New York Herald* which he “read and re-read from beginning to end.”¹⁷ During the days he would occupy himself by catching flies and putting them in a spider’s web. He then “rescued the fly just as the spider was about to grab him.”¹⁸

One night he heard soldiers marching towards his house and then entering. He hid in the wine cellar finding “a satisfactory hiding-place in the extreme rear of the cellar”¹⁹ between two big wine cases. The cellar contained 1,800 bottles of choice wine. O’Brien writes that “rats and mice were scurrying across the floor”²⁰ and that “some of the creatures ran across me ...”²¹ Standing in the dark with “a bottle of wine in each hand,” he prepared to defend himself against the Germans who “were smashing and crashing” upstairs searching for him.²²

Just as the soldiers were outside the cellar door, he heard “Halt!” and the soldiers turned “right about face”²³ and left. When O’Brien finally got the courage to creep upstairs, he discovered the “water faucets ... water pipes ... everything brass or copper ... torn off, and gas fixtures, cooking utensils ... [and anything of metal] the Germans so badly needed [for their war effort] had been taken from the kitchen.”²⁴ They hadn’t been searching for him after all—just badly needed war supplies. He stayed in the house for five days before resuming his hike to the Dutch border and freedom.

Finally reaching the Dutch border, O’Brien was confronted by a nine-foot [2.7-m] electrified fence. Feeling “like a wild animal in a cage,”²⁵ he contemplated pole vaulting the structure or building a pair of stilts. He settled on two fallen pine trees. Stripping off all the branches, he used the branches as ladder rungs, “tying them to the poles with grass and strips from my handkerchief and shirt the best I could.”²⁶ Placing the ladder against a wooden fence post he began climbing. The ladder slipped into the wires—“a blue flash ... and I fell heavily to the ground unconscious!”²⁷

When he came to, he decided to dig a hole with his bare hands under the fence, a three-hour ordeal—all the while ducking and dodging German sentries. Once under the fence, he was free in Holland. The week before Christmas he was back in London and presented with great public fanfare to King George V. He had become an Allied hero; his story was broadcast around the world. The King spent three hours interviewing O’Brien about his “wonderful escape.”²⁸ The young aviator found the British sovereign “keen on everything ... [and] a very genial, gracious, and alert sovereign.”²⁹ O’Brien told the King he was anxious to rejoin his unit but was bluntly told “that is out of the question. ... [I]f you were unfortunate enough to be captured again [the Germans] would undoubtedly shoot you. ... I think you have done enough ...,” the King told him.³⁰ Without a compass and only the North Star (when visible) to guide him, O’Brien reckoned he

traveled 250 miles [402.3 km] during his escape, even though “the actual distance from his starting point [in Germany] to Holland ... [was] only about seventy-two miles [115.9 km].”³¹ He dedicated his book to the North Star.

In January 1918, O’Brien was honourably discharged and returned home to Momence, Illinois. That same year he wrote his bestseller, which was serialized in numerous newspapers worldwide. Additionally, he went on a national speaking tour. By 1919, he was a wealthy man. He moved to Hollywood where he wrote and produced a movie in which he starred with Virginia Allen whom he married. His “yellow scare” movie was financially and critically unsuccessful, and his marriage collapsed. Busted and unsuccessful in his reconciliation attempts with Virginia, O’Brien shot himself a week before Christmas 1920. He was 30 years old.

O’Brien’s book is an exciting, action-packed story about a real-life wartime experience. In a sense, it’s a “how to” manual that should be read by air-force professionals who might find themselves shot down behind enemy lines or in hostile territory. Historians and scholars will gain a genuine sense of the struggles and deprivations that civilians experienced during that horrible conflict, which took so many lives—military and civilian. O’Brien’s book was a best seller in 1918. While the story is nearly 100 years old, it is still relevant today and is a very enjoyable read. 🇨🇦



Lieutenant Pat O'Brien in his RAF uniform.



The aeroplane [Sopwith Pup] which Lieutenant O'Brien used in his last battle with the Huns when he was brought down and taken prisoner.

Daniel Demers is a semi-retired businessman whose hobby is researching and writing about 19th- and 20th-century historical events and personalities. He holds a degree in history from George Washington University and a master’s degree in Business Administration from Chapman University.

Abbreviations

km kilometre

m metre

RFC Royal Flying Corps

Notes

1. Lieut. Pat O’Brien, *Outwitting the Hun: My Escape from a German Prison Camp* (New York: Harper and Brothers, 1918), 33, accessed December 17, 2014, <http://www.gutenberg.org/files/42490/42490-h/42490-h.htm>.

2. “Flier O’Brien Safe at Home, Potsdam Papers Please Copy,” *New York Tribune*, January 21, 1918, accessed December 17, 2014, <http://chroniclingamerica.loc.gov/lccn/sn83030214/1918-01-21/ed-1/seq-12/#date1=1836&index=8&rows=20&words=Canadian+Corps+Flying+Royal&searchType=basic&sequence=0&state=&date2=1922&proxtext=Royal+Canadian+flying+corps&y=0&x=0&dateFilterType=yearRange&page=1>.

3. O'Brien, *Outwitting the Hun: My Escape from a German Prison Camp*, 86.

4. Ibid., 124, 142.

5. Ibid., 9.

6. Ibid., 12.

7. Ibid., 35.

8. Ibid., 36.

9. Ibid., 37.

10. Ibid., 37–38.

11. Ibid., 85.

12. Ibid.

13. Ibid., 87.

14. Ibid., 113.

15. Ibid., 115.

16. Ibid., 187–88.

17. Ibid., 194.

18. Ibid.

19. Ibid., 197.

20. Ibid., 198.

21. Ibid., 199.

22. Ibid.

23. Ibid., 200.

24. Ibid., 201.

25. Ibid., 239.

26. Ibid., 240.

27. Ibid., 242.

28. Ibid., 277.

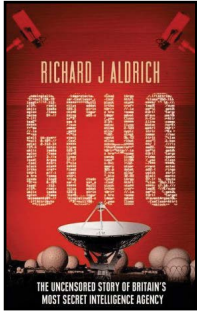
29. Ibid., 278.

30. Ibid., 279.

31. "Flier O'Brien Safe at Home."



A group of prisoners of war in the prison camp at Courtrai, Belgium. Lieutenant O'Brien, in his RFC flying tunic, is standing in the centre behind the German guard seated at the table. This picture was taken by one of the German guards and sold to Lieutenant O'Brien for one mark.



GCHQ: THE UNCENSORED STORY OF BRITAIN'S MOST SECRET INTELLIGENCE AGENCY

By Richard Aldrich

London, United Kingdom: Harper Collins, 2011

666 pages

ISBN 978-0-00-731266-5

Review by **Lieutenant-Colonel Doug Moulton, CD, MBA**

As the Canadian Forces Liaison Officer to the United Kingdom Air Warfare Centre at Royal Air Force (RAF) Waddington, I have been privileged and honoured to view the United Kingdom from a unique perspective. One of the truly outstanding opportunities I have had was to participate in a Government Communications Headquarters (GCHQ) introduction course. The result has been an ongoing curiosity about the history of British intelligence agencies. The acquisition of Richard Aldrich's *GCHQ: The Uncensored Story of Britain's Most Secret Intelligence Agency* has provided another opportunity to gain perspective on the topic. Mr. Richard J. Aldrich is a Professor of International Security at the University of Warwick and has written a number of books dealing with intelligence matters.

Despite being a secret intelligence organization, GCHQ is probably as well known to the British public as the Royal Mail. Although, this was not always the case; in fact, the existence of GCHQ as an intelligence organization was not publicly acknowledged until the mid-1980s.

The book, written chronologically, takes the reader decade by decade through the organization's amazing history. Starting with the Second World War, Aldrich provides insights into the Bletchley Park creation of GCHQ from its Government Code & Cypher School (GC&CS) origins and the critical breaking of Axis codes to the challenges of keeping up with today's ubiquitous computing.

An extensively researched book, Aldrich has taken the opportunity to provide a unique insight into the story behind the public identity of GCHQ. Focusing on the main historical events that shaped the organization's development, Aldrich puts into context the ongoing requirements of governments to maintain an edge against their competitors. This requirement then, in turn, drives the creation of new capabilities to meet these ever-changing needs.

The appropriate maps, figures and photographs complete Aldrich's effort in the telling of the GCHQ story. Aldrich also takes the time to delve into the personalities that shaped the organization, from the first GCHQ director, Sir Alastair Denniston, to the current Sir Iain Lobban. These personalities, in historical context, provide an understanding of GCHQ's successes and failures. Additionally, the inclusion of a detailed timeline allows the reader to see, at a glance, the major events that shaped GCHQ's development.

GCHQ: The Uncensored Story of Britain's Most Secret Intelligence Agency is a well-researched and well-written book that will prove an enjoyable and easy read for the intelligence enthusiast. 📖

Lieutenant-Colonel Moulton, a Sea King pilot, is currently the Chair of the Department of Program Support, Canadian Forces College, Toronto.

Abbreviation

GCHQ Government Communications Headquarters

INFORMATION MANAGEMENT

DESPERATE TIMES CALL FOR DESPERATE MESSAGING TECHNIQUES

BY CAPTAIN LIZ ALLARD, CD

By the time you read this article, you may have heard from or about your wing or unit information management officer (IMO), and you may be asking yourself, “What bright light dreamed this up?” Since the Royal Canadian Air Force (RCAF) made computers easily accessible to nearly every member, we have begun to flounder in an ever increasing sea of unorganized digital information. The unfortunate reality of our increased reliance on technology—which until now, has been without boundaries—is the decreasing capability of finding the right information in a timely manner. This has negative implications, both operational and legal. Enter the IMO.

In response to the increasing information chaos, in 2009, the Treasury Board Secretariat issued direction to all departments instructing them to identify, protect, and manage information resources of business value. Record-keeping practices are to be documented and practised within the Department of National Defence (DND) and the Canadian Armed Forces, and the deadline provided is March 2015. For whatever reason, the RCAF has found itself well behind the power curve in implementing the requirements of the Treasury Board’s directive. As the deadline fast approaches, newly appointed RCAF IMOs are finding themselves under the gun to take action. So how can you help?

To begin, everyone must understand that information management (IM) is about people and processes, not new computer hardware and software. The processes are what used to be called “staff duties,” and many of the more “experienced” among us remember the days of asking the orderly room clerk for the appropriate file number to assign to the memo we were writing. That requirement to use file numbers never went away; however, with the introduction and convenience of email, it was not rigidly enforced. Therefore, the first thing you can do to help your unit IMO is to adopt the published IM best practices (the new lingo for staff duties).



Annually, it costs approximately \$6 to maintain 1 gigabyte of shared network server space. While you may think that your little folder only represents \$200 per year, multiply that by the thousands of little folders on the system, and it soon becomes apparent that the RCAF is spending a bucket of money to store dated, redundant, and non-work-related information. Therefore, the second thing you can do to assist your IMO is to audit your information stored on the network and archive it on to compact disc or delete what is considered old and/or redundant. Afterwards, restructure your unit's folder architecture to better reflect your unit's work.



Finally, all members can educate themselves about the requirements and benefits of IM. There is a one-hour tutorial called "DND/CF Information Management" on the Defence Learning Network¹ that all members were directed to have completed by October of 2013. As of 2 Dec 2014 only 64 per cent of RCAF personnel had completed this training.

The 60-million-dollar question that has likely crossed your mind about now is: "What is in it for me?" Once the RCAF IM state of affairs has been improved, you can expect to be able to more efficiently respond to requests made under the Access to Information Act and, more importantly, you will be able to support your leaders' decision making by being able to provide the right information much more quickly.



IM is not a passing fancy. Although its arrival is overdue, it is here to stay and we must embrace it in order for the RCAF to remain effective in our increasingly digital battlespace. 🇨🇦

Captain Liz Allard, CD, a CC130 air combat systems officer, is currently stationed at the Canadian Forces Aerospace Warfare Centre as the Information Management Officer. She has a degree in Political Science and has twice deployed to Haiti with Canada's Disaster Assistance Response Team.

ABBREVIATIONS

DND	Department of National Defence
IM	information management
IMO	information management officer
RCAF	Royal Canadian Air Force



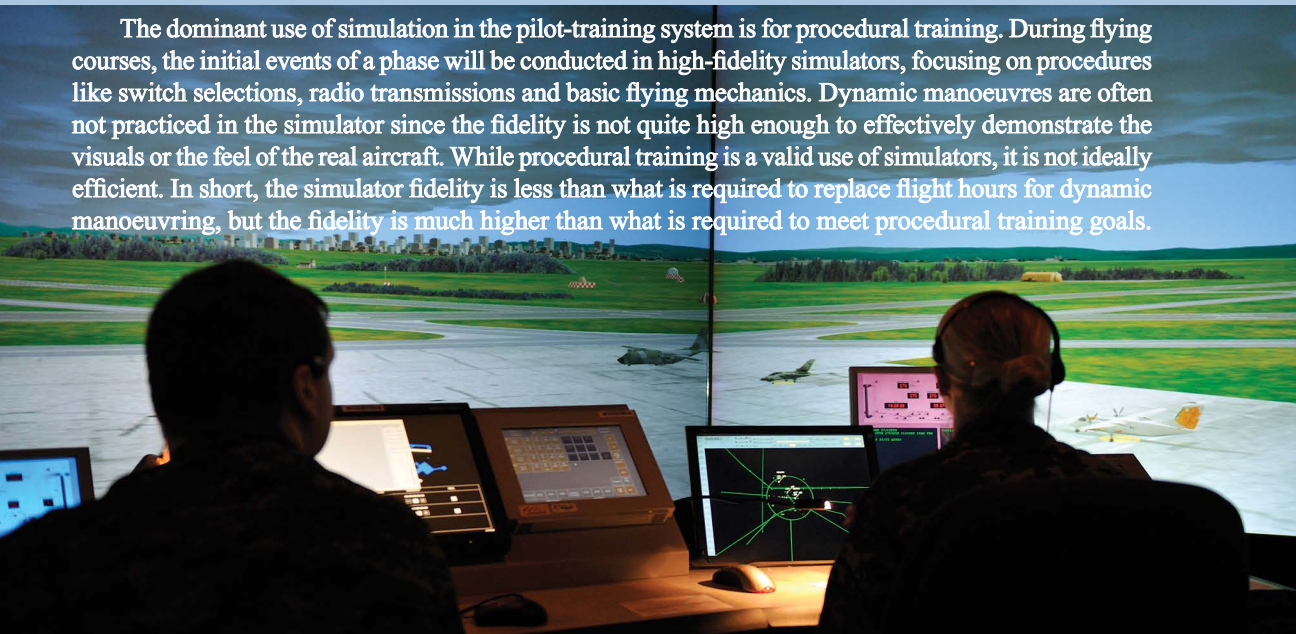
NOTE

1. Canada, Department of National Defence, Defence Learning Network, accessed February 11, 2015, <http://dln-rad.mil.ca/Saba/Web/Main> (requires login).

SHIFTING PARADIGMS: Aerospace Simulation in the RCAF

“Economy of effort requires that minimum means and resources be expended or employed in areas other than where the main effort against the enemy is intended to take place.”¹ Aerospace simulation in the Royal Canadian Air Force (RCAF) should follow the principle of economy of effort since we do not meet the enemy in a simulated world. Lieutenant-General Yvan Blondin, Commander of the RCAF, has stated, “I believe we can achieve better training through simulation and achieve operational savings. In doing so, we can extend the life of our aircraft, and, at the same time, reduce our carbon footprint. This is good for the RCAF operationally, and will also be good for Canada fiscally.”² The Commander’s intent, therefore, is to use economy of effort to achieve better training through aerospace simulation. To best achieve this intent, two paradigm shifts are required. First, the training paradigm must move away from using very few maximum-fidelity simulators and, instead, move toward more simulators with generally lower levels of fidelity, designed for more targeted training objectives. Second, the acquisition process for simulators must change to account for the explosion of software development capability now available in the marketplace.

The dominant use of simulation in the pilot-training system is for procedural training. During flying courses, the initial events of a phase will be conducted in high-fidelity simulators, focusing on procedures like switch selections, radio transmissions and basic flying mechanics. Dynamic manoeuvres are often not practiced in the simulator since the fidelity is not quite high enough to effectively demonstrate the visuals or the feel of the real aircraft. While procedural training is a valid use of simulators, it is not ideally efficient. In short, the simulator fidelity is less than what is required to replace flight hours for dynamic manoeuvring, but the fidelity is much higher than what is required to meet procedural training goals.



By Major Ryan Kastrukoff, MAS

This delta between training goal and simulator capability is wasted effort. In the place of one very high (but not quite high enough) fidelity simulator, we could instead develop many simulators whose fidelity better correlates to the training requirements. For example, there is only one flight simulator available for all the Phase 4 Hawk pilots in Cold Lake, and it is not networked to any other simulations or simulators. During Phase 4 Hawk training, the vast majority of student flights involve two or more aircraft. Without more than one simulator, the inter-plane crew dynamics cannot be effectively simulated. Meanwhile, a commercially available, multiplayer, combat-simulator video game could effectively practice the inter-plane crew dynamics at a drastically lower cost per hour.

The key to the next generation of simulation will be matching the fidelity to the stated aim(s). For example, a significant training objective for both forward air controllers (FACs) and fighter pilots is to develop the ability to “talk-on” the eyes of the pilot to the intended ground target. A low-fidelity simulation could easily meet this initial objective, reducing the need for expensive flight hours and/or higher fidelity simulator hours. A possible simulation would see the FAC at an Army base looking at Google Earth with a simulated eye level at the surface while the pilot at a distant Air Force base would look at the same Google Earth location with a simulated eye level at flight altitude. The two (and potentially their instructors) would then just need a phone call between them to practice the talk-on. This has the advantage of using different air-to-ground ranges around the world or even real-world combat zones for more realism in a lower fidelity simulation while still meeting the training objective.

To match the fidelity requirements to the training aim(s) requires a closer link between personnel in the force-generation, force-employment, research and acquisition branches. Since the next generation of aerospace simulation is in its infancy, now is the time to examine what we could accomplish with modern simulation technology. There are many options beyond procedural training. By leveraging modern networking technology, larger simulation environments can be created for joint and combined training. Satellite imaging technology has effectively declassified air-weapons ranges (by making them open to near-real-time observation), but simulation could provide a secure means to train and develop classified tactics hidden from adversary view. The RCAF chain of command has recognized the increased potential for simulation,³ however, the process can occur more quickly if the “pointy end” of the training system identifies efficiencies and informs the chain of command now.

The use of simulation is common across all RCAF operations. Air traffic control (ATC), aerospace control, command centres and flying units all use simulation for at least some of their training. The simulated world created for all of these different units is modelling the real world outside. Therefore, if we are all trying to model the same thing, we should be “flying in formation” and developing that world together. Instead of replicating an aircraft and simulating the parts of the world that are required, we could reverse the paradigm and replicate the world and simulate the parts of the aircraft that we need. Ultimately, the same laws of physics apply to all aerospace assets. This paradigm shift means that we build a common simulated world for everyone. By design, networking these worlds together later on could be trivial.

A common world would also allow for the simulation budgets of the different fleets and trades to be combined, reducing the overall cost of simulation for the RCAF. Each fleet or trade would define their training objectives and the modules of the simulated world that they need, and every other fleet/trade would benefit from the resulting modules. Transport could develop better weather models, ATC could develop better traffic models, tactical helicopters could develop better ground models and fighters could develop better electronic warfare (EW) models, but they each can plug in the upgrades developed at the request of the other fleets.

Common-world production would also create benefits for research and development interests, since a radar model built for a fighter simulator could have its fidelity increased, thus producing a research model. That same research model could then go back to the fighter community and be used in batch runs to develop better EW tactics, which then drives future research requirements.

This paradigm shift—from building the airframe first to building the world first—also opens up the contracting possibilities. The designer of the simulated-world model does not need specialized access to classified documents, allowing the bulk of the model creation to be contracted out to software-development firms, with separate subcontractors brought in to write the classified modules where required. The larger number of software-development firms now available for potential contracts should increase competition and lower cost, again improving overall efficiency.

Overall, the two paradigm shifts discussed above offer the potential for better training, better interoperability, better tactics and better research—all at a lower cost. Creating the simulated world first and adding modules on top ensures that future upgrades could also remain cost-effective while helping the RCAF fly in formation. This layered software-development model already exists in the commercial gaming industry and works well. A hammer is a good tool and will fix many problems. Over time, however, we've developed other tools to complement the hammer and achieve greater overall success. The old method of using a few very high-fidelity simulators to achieve our training goals is akin to the hammer. Improved software-design methods, networking capabilities, computer hardware and effects-based training objectives are the complementary tools that will allow us to achieve economy of effort and better, cheaper training through aerospace simulation. 🌐

Major Ryan Kastrukoff is currently posted to 419 TACTICAL Fighter (Training) Squadron as an instructor pilot. Born and raised in the Vancouver suburbs, he earned a Bachelor of Science in Physics and Computer Science from the University of Toronto before joining the RCAF. He subsequently earned a Master of Aeronautical Science in Space Science from Embry-Riddle Aeronautical University in 2013. Major Kastrukoff has flown the CF188 Hornet, currently flies the CT155 Hawk and has deployed to Operation ATHENA, Operation PODIUM, Operation NOBLE EAGLE and northern sovereignty operations.

Abbreviations

ATC	air traffic control
EW	electronic warfare
FAC	forward air controller
RCAF	Royal Canadian Air Force

Notes

1. Canada, Department of National Defence, B-GJ-005-000/FP-001, Canadian Forces Joint Publication 01, *Canadian Military Doctrine* (Ottawa: Canadian Forces Experimentation Centre, 2011), 2-5.
2. Dave Wheeler, "Canada's Future Fighter: A Training Concept of Operations," *Canadian Military Journal* 13, no. 2 (2013): 68, accessed January 12, 2015, <http://www.journal.forces.gc.ca/vol13/no2/page68-eng.asp>.
3. "Aurora Aircraft Crews Use Simulation to Rehearse for Future Missions," Major Sonia Dumouchel-Connock, Royal Canadian Air Force, accessed January 12, 2015, <http://www.rcaf-arc.forces.gc.ca/en/article-template-standard.page?doc=aurora-aircraft-crews-use-simulation-to-rehearse-for-future-missions/huwd2rdd>; and "Embracing the Future: RCAF Finds Solutions in Innovative Training Technologies," Major Sonia Connock, Royal Canadian Air Force, accessed January 12, 2015, <http://www.rcaf-arc.forces.gc.ca/en/news-template-standard.page?doc=embracing-the-future-rcaf-finds-solutions-in-innovative-training-technologies/ht8s3wor>.

THE RCAF PROFESSIONAL AND AIR FORCE OPP: Operational Design and Planning for Smaller Headquarters

PUSHING THE
ENVELOPE

By Lieutenant-Colonel Dan S. Coutts, CD, MA

The challenge

Professional discourse regarding the Royal Canadian Air Force's (RCAF's) best practices continues to evolve, but there has yet to be doctrine published which specifically aims at the design of and planning for Canadian expeditionary air power at the operational level. The Canadian Forces operational planning process (CF OPP) has been optimized for a larger headquarters. While an air task force (ATF) must be capable of designing and planning at the operational level, the size of the RCAF means that any deployed structure will be relatively small. As an example, the current ATF template consists of approximately 250 personnel, many of whom fill operations support and mission support roles.¹ By comparison, Canadian Joint Operations Command headquarters—an entity focused solely on designing, planning and controlling operations—has roughly 500 personnel.² The RCAF professional needs a scaled-down Air Force (AF) OPP that maximizes effectiveness without incurring too much planning risk; this précis proposes four conservative adjustments to the CF OPP.

Method and literature

This précis was adapted from a paper that analysed two main decision-making traditions—Analytical Decision Making (ADM) and Naturalistic Decision Making (NDM)—and identified the strengths and weaknesses of each with a view to suggesting modifications to the CF OPP.³ ADM and NDM are roughly analogous to two terms which have been receiving closer attention among Western military professionals: planning and design. “*Planning* is a process of making detailed preparations to achieve a particular end,”⁴ [emphasis added] while *design* is an activity or exercise which is naturalistic and helps to communicate a conceptual framework of a complex system which enables planning.

Most Western approaches to problem solving at the operational level contain a degree of planning and design. Israelis have experimented heavily with NDM approaches, and new American Army, Marine and joint operational planning doctrines have a heavier emphasis on NDM.⁵ The doctrine of Canada and her other close partners continues to place an overly heavy emphasis on the ADM tradition.⁶


A possible solution

While CF OPP contains elements of both ADM and NDM, a better balance between these traditions is one answer to the challenge described above. From the NDM perspective, framing (“the act of building mental models to help individuals understand situations and respond to events”⁷) should be included at the outset of AF OPP along with the other activities of Stage 1 (Initiation). Framing could also subsume some steps from Stage 2 (Orientation), such as “review situation” and “review (higher level).”⁸ The more technical steps in Stage 2 should remain where they are.⁹

In Stage 3, “staff analyse factors” speaks directly to the core ADM advantages of clarity and detail, while helping practitioners gain a clear understanding of the situation.¹⁰ This stage should continue to be emphasized. However, the development of multiple friendly courses of action (COAs) should be discontinued, as all COAs are ultimately fathered by the same broad design and, thus, are not significantly differentiable. The development of only one COA is likely a better investment of effort, especially if time is allowed for multiple iterations of COA testing and modification.¹¹ A heavier emphasis on war gaming can minimize this planning; most countries and the North Atlantic Treaty Organization (NATO) heavily emphasize war gaming as a value-added activity.¹²

The remainder of the detailed work in CF OPP would be difficult to shrink much further. However, one more value-added practice appearing in both American and British doctrine offers significant promise for high-tempo planning: red teaming. In simple terms, “[r]ed teaming provides an independent capability to fully explore alternatives in plans and operation in the context of the operational environment and from the perspective of adversaries and others”¹³ and results in well-rounded designs and plans.¹⁴ The use of a small red team within an ATF could mitigate the risks inherent in scaling down and speeding up operational planning.

Recommendations

This précis makes four recommendations: Place framing at the commencement of the design and planning process; develop only one friendly COA; increase emphasis on war gaming; and add a red-teaming component to operational planning. AF OPP could be more comprehensive, faster and adaptive while retaining clarity, detail, replicability and simplicity of use for the inexperienced practitioner. The RCAF professional would be well served by the development of an AF OPP; further effort in research should be committed to developing and validating a planning process tailored to the realities facing expeditionary ATFs. 

Lieutenant-Colonel Dan Coutts is a helicopter pilot who has served with 427 and 400 Squadrons as well as filling a number of staff and training billets within 1 Wing. A graduate of Royal Military College of Canada and Canadian Forces College, he is currently the Commanding Officer, 2 Air Expeditionary Squadron at 2 Wing, Bagotville.

Abbreviations

ADF	Australian Defence Force
ADFP	Australian Defence Force Publication
ADM	Analytical Decision Making
AF	Air Force
AJP	Allied Joint Publication
ATF	air task force
CF	Canadian Forces
COA	course of action
DND	Department of National Defence
JP	Joint Publication
MCWP	Marine Corps Warfighting Publication
MOD	Ministry of Defence
NATO	North Atlantic Treaty Organization
NDM	Naturalistic Decision Making
OPP	operational planning process
RCAF	Royal Canadian Air Force
UK	United Kingdom
US	United States

Notes

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Lions and Tigers and Bears! Oh, My!

To Colonel Kelvin Truss, Editor in Chief, Royal Canadian Air Force Journal

Sir:

I would like to take this opportunity to congratulate you for opening a discussion on Canadian defence issues in the Summer 2014 edition of the *Royal Canadian Air Force Journal (RCAFJ)*. The Point/Counterpoint section is a much needed forum in which we can freely debate the issues and provide our opinions/insights on critical matters.

The McKillips' Point article, "F35s and the Canadian 'Military-Technical Condition,'" is an excellent vehicle to lead off with. Your Counterpoint² to their article raised three interesting perspectives, but to my mind, if such arguments are not properly framed, further discussions are moot, as they will not progress meaningfully beyond a paper exercise. In the spirit intended, I would like to add some points on the monetary issues; principally, defence spending as a percentage of gross domestic product (GDP).

The McKillips make clear that the essential point of the military is that it "must be able to overmatch any threat to the nation's existence."³ But the fundamental question has always been, "at what cost?" Truly, there is no definable boundary to budgetary needs that adequately addresses the premise. Budgets are constrained by a nation's ability to pay and, ostensibly in the end, what the taxpayers are also willing to bear.

Classifying and quantifying security obligations around a construct of domestic and/or collective security obligations as the McKillips do⁴ has been used as a framework to sell the point to Canadians. However, whatever argument is used is merely the smoke and mirrors in selling a palatable programme that Canadians are willing to bear which supports their interests and that best minimizes risks commensurate to the threats at hand. But, then again, at what level? How much is enough? The McKillips posed these questions and then summed up with "How long is a piece of string?"⁵

This is the truly relevant point. We cannot do everything, which leads to the question of what budgetary framework is required in order to balance needs and that minimizes the risk of failure and defeat and that maximizes success. The construct of building a Canadian defence programme on the basis of collective defence may have been debunked, and orienting the defence mission toward domestic requirements may be a preferred option; however, regardless of the construct of the argument, both require some measure of investment and assessment of their relevance, both to Canadians and their allies. You simply cannot show up with a knife to a gunfight and be considered relevant.

To state that Canadian military contributions may always be welcome, regardless of the specific nature of the force, is indeed laudable. However, questions on the force employed, its relevance, and the decisions surrounding the deployment of the force are often criticized in the court of public opinion. Relevance and utility are important to not only Canadians but also our allies, otherwise we are simply a burden. Canada's agreements must include a mechanism that ascertains our true relevance and the worth of the capabilities provided to either collective defence or domestic security. These are the divergent poles upon which the outcomes of a defence services programme are truly measured.

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The McKillips' posit this statement: "Although there have been efforts to tie defence structures to cost benchmarks such as percentage of gross domestic product or percentage of federal government spending, these measures have never proven very useful."⁶ This statement suggests this measure is irrelevant, but in fact, it is essential to getting anything done and advancing the capital programme. There is a corollary to their "how long is a piece of string?" which is, "how effective is the short string?" The measure of the short string could be viewed as having the entire Defence Services Program (DSP), votes for grants, operations and maintenance, and capital orchestrated all within the context and boundaries of the defence spending percentage of GDP.

It is often a quest of epic proportions as defence planners, in an attempt to reach this figure, juggle the needs of their seniors and politicians. National Defence Headquarters, often likened by those who have served there as "Fort Fumble on the Rideau" or the "Puzzle Palace," has faced this struggle on a yearly basis, encountering challenges reminiscent of going down the yellow brick road on the quest to locate the Great Wizard of Oz to get Dorothy home. The refrain "Lions and tigers and bears! Oh, my!"⁷ often comes to mind as budgets are shifted and options are changed in the delivery of Canada's defence capability, which has been characterized by some as merely shifting the deck chairs on the sinking *Titanic*. Meanwhile, the band plays on!

The measures of the percentage of GDP or percentage of federal government spending are relevant to all with an interest in the DSP. It is basically a government's statement of intent as to how far it is willing to support its armed forces and prosecute its foreign and domestic policies.⁸ It is the stability that provides the planning view. It is very indicative of the role that the government desires and points out the extent it is willing to play on the world stage. It is the foundation of the structure of the Canadian Forces that is supportable by the Canadian public. At the same time, it may be seen as a direct measure of the risk a government is willing to undertake by not funding the programme relative to all of the perceived threats and requirements. There is much data to support its relevance and, in my opinion, the measure has been proven useful.⁹

The percentage of GDP is the foundation of the arguments still to come on the relevance of the F35 and other procurement programmes that are on the table for defence renewal, some of which—such as the maritime-helicopter project and Navy ships—have been on the table for a very long time. It is the essential argument of the boundary that sets the tone for the selection of the priorities within the DSP.

The ability to move the markers on many of these projects, as well as on future investment, is stymied by a lack of funding that is directly tied to the percentage of GDP that the government has allocated for defence spending. So, changes to the percentage of GDP allocated to defence should be of great concern to all! It is the relevant marker. It is the harbinger of good times or bad, and that benchmark is indeed relevant to the discussions that must surely ensue, particularly on the F35 file, if proper decisions leading to effective defence procurement and renewal are to be attained. Dorothy would never get back to Kansas by clicking only one ruby slipper! 🍷

Gerry Madigan

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Abbreviations

DSP Defence Services Program
GDP gross domestic product

Notes

1. Major J. D. McKillip and R. W. H. McKillip, "Point: F35s and the Canadian 'Military Technical-Condition,'" *The Royal Canadian Air Force Journal* 3, no. 3 (Summer 2014): 55.
2. Colonel Kelvin Truss, "Counterpoint," *The Royal Canadian Air Force Journal* 3, no. 3 (Summer 2014): 59.
3. McKillip and McKillip, "Point," 55.
4. Ibid., 56.
5. Ibid.
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