

FALL 2011  
VOL. 4, NO. 4

THE CANADIAN

# AIR FORCE JOURNAL

## IN THIS ISSUE:

**ULTRA-HIGH FREQUENCIES  
GOING ONCE,  
GOING TWICE...**

PRIMER IN  
AIR MOVEMENTS

**THE AIR HISTORIAN  
- PART II**

**BOOK REVIEWS**

AIRMEN'S OBITUARIES:  
BOOK TWO

THE AGE OF AIRPOWER

**AND MUCH MORE!**



PRODUCED BY

THE CANADIAN FORCES  
AEROSPACE WARFARE CENTRE



National  
Defence

Défense  
nationale

Canada

**THE CANADIAN AIR FORCE JOURNAL** is an official publication of the Commander of the Royal Canadian Air Force and is published quarterly. It is a forum for discussing concepts, issues and ideas that are both crucial and central to aerospace power. The *Journal* is dedicated to disseminating the ideas and opinions of not only Air Force personnel, but also those civilians who have an interest in issues of aerospace 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 Air Force. It serves as a vehicle for the continuing education and professional development of all ranks and personnel in the Air Force as well as members from other environments, employees of government agencies and academia concerned with Air Force affairs. ■

## **EDITORIAL STAFF**

Editor-in-Chief: Colonel Derek Joyce, OMM, CD

Senior Editor: Major William March, CD, MA

## **EDITORIAL BOARD**

Colonel William Lewis, OMM, CD, M Eng, M Ed, MBA, MDS, PhD (Retired) – Royal Military College

Lieutenant-Colonel Paul Johnston, CD, MA – J2 Operations and Training, Chief Defence Intelligence

Major Raymond Stouffer, CD, PhD – Royal Military College

Dr. Allan English, CD, PhD – Queen's University

Dr. James Fergusson, PhD – University of Manitoba

Dr. Stephen Harris, CD, PhD – Directorate of History and Heritage

Dr. Randall Wakelam, CD, PhD – Royal Military College

Published by Canadian Forces Aerospace Warfare Centre, Trenton, Ontario

ISSN 1916-7032

## **ASSISTANT EDITORS**

Ernie Alkenbrack, Adri Boodoosingh and Françoise Romard

## **GRAPHIC DESIGN**

Denis Langlois and Luc Leroy

## **ONLINE EDITION ANIMATION**

Hope Smith

[http://www.airforce.forces.gc.ca/cfawc/eLibrary/Journal/Current\\_Issue\\_e.asp](http://www.airforce.forces.gc.ca/cfawc/eLibrary/Journal/Current_Issue_e.asp)

[http://trenton.mil.ca/lodger/cfawc/eLibrary/Journal/Current\\_Issue\\_e.asp](http://trenton.mil.ca/lodger/cfawc/eLibrary/Journal/Current_Issue_e.asp)

## **PRODUCTION MANAGER**

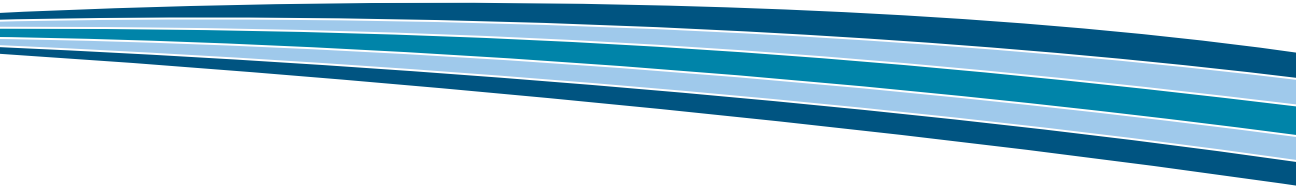
Anne Pennington

For copies of this publication or to be placed on a distribution list contact Anne Pennington at [Anne.Pennington@forces.gc.ca](mailto:Anne.Pennington@forces.gc.ca)

## **NOTE TO READERS**

As a bilingual journal, readers should take note that where quotations are translated from their original language, we will use the term [Translation] at the end of the quote to indicate that readers can find the original text in the other language version of the *Journal*.

**THE CANADIAN  
AIR FORCE JOURNAL**



## SUBMISSION REQUIREMENTS


**THE CANADIAN AIR FORCE JOURNAL** welcomes the submission of articles, book reviews and shorter pieces (which will be published in the Letters to the Editor, Points of Interest and Pushing the Envelope 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>Journal</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"><li>• the book's complete title (including sub-title);</li><li>• the complete names of all authors as presented on the title page;</li><li>• the book's publisher, including where and when it was published;</li><li>• the book's ISBN and number of pages; and</li><li>• a high resolution .jpg file (at least 300 dpi and 5 by 7 inches) of the book's cover.</li></ul>
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>Journal</i> articles and/or issues that are of interest to the broader aerospace audience.

\* 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 or at the beginning of the text of the article.
- 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 (ie., not imbedded in the text). Original vector files are preferred; high resolution (not less than 300 dpi) .psd or .jpg files may be submitted.
- 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 Little, Brown Handbook*, *Le guide du rédacteur* or CFAWC Production Section at [Francoise.Romard@forces.gc.ca](mailto:Francoise.Romard@forces.gc.ca)
- Acronyms and abbreviations should be used sparingly:
  - 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 brackets.
  - If they are required in tables or figures, each table and figure will contain a list of abbreviations.
  - 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.

## FOR FURTHER INFORMATION OR TO MAKE A SUBMISSION PLEASE CONTACT THE EDITOR AT:

Canadian Forces Aerospace Warfare Centre  
8 Wing Trenton  
Box 1000 Stn Forces  
Astra, Ontario K0K 3W0  
Attn: Major William March

[William.March@forces.gc.ca](mailto:William.March@forces.gc.ca)

## DISCLAIMER

Opinions expressed in the *Journal* remain those of the author and do not represent Departmental or Canadian Forces policy. Doctrine, training and other material published in the *Journal* does not represent authority for action on that particular topic. All published material remains copyright of the Department of National Defence and may not be used without written permission.

**CALL FOR SUBMISSIONS**  
FOR THE SPRING 2012 ISSUE: 30 JANUARY 2012  
FOR THE SUMMER 2012 ISSUE: 30 APRIL 2012  
FOR THE FALL 2012 ISSUE: 30 JULY 2012  
FOR THE WINTER 2013 ISSUE: 30 OCTOBER 2012

# IN THIS ISSUE

FALL 2011 • VOL. 4, NO. 4

4 EDITOR'S MESSAGE

## ARTICLES

5 ULTRA-HIGH FREQUENCIES

Going Once, Going Twice...

By Major Patrick Hovis, CD

9 PRIMER IN AIR MOVEMENTS

Basic Loads to Combined Air Terminal Operations and Beyond

By Captain Tony Johnson, CD

22 THE AIR HISTORIAN

Part II

By Hugh Halliday

31 WHAT AIR FORCES DO

By Lieutenant-Colonel Brian L. Murray, CD

CF Photo: Cpl Brandon O'Connell

## BOOK REVIEWS

48 THE DAILY TELEGRAPH AIRMEN'S OBITUARIES

Book Two

Review by Colonel Peter J. Williams, CD

50 THE AGE OF AIRPOWER

Review by Major Chris Buckham, CD, BA, MA

## POINTS OF INTEREST

52 TERMINOLOGY TALK (Article 2)

"Deployed" versus "Expeditionary"

by Major James Bound, CD, BSc (Hons)

58 CYBER IS THE COMMANDER'S BUSINESS

by Major Philippe Legere, CD

64 RECOGNIZING ACHIEVEMENT IN CANADA'S  
AVIATION HALL OF FAME

By John Chalmers

CF Photo



# EDITOR'S MESSAGE

Welcome to the last issue of *The Canadian Air Force Journal* (CAFJ)! With the announcement by the Minister of National Defence, Peter MacKay, on 16 August 2011, that the Canadian Air Force would once again be known as the Royal Canadian Air Force (RCAF), another page has turned in Canadian military aviation history. Throughout the Air Force this became the starting point for a gradual process to re-introduce the RCAF nomenclature into publications, documents and orders. Production staff at the Canadian Forces Aerospace Warfare Centre (CFAWC) are busy working on a new cover layout and *The Royal Canadian Air Force Journal* (RCAFJ) will be introduced with the publication of a first issue in 2012.

With the restoration of the RCAF name, there may be a natural tendency to focus on the linkages with the pre-1968 RCAF. Although understandable, the RCAF of 2011 is the sum of far more constituent parts. Incorporated into our history and heritage are those who have gone before us not only as members of the RCAF, but as naval aviators from the Royal Canadian Navy and army flyers from the Canadian Army—not to mention the individuals who served as part of the Air Element and Air Command of the Canadian Forces. In many ways, the re-emergence of the RCAF in 2011 has more in kin with the original birth of the RCAF on 1 April 1924. On that date, the original cadre, small as it was with fewer than 400 souls, contained members who had served with the Royal Flying Corps, Royal Naval Air Service, Royal Air Force, and the short-lived Canadian Air Force. On that spring day so many years ago, individuals from many different backgrounds came together under the banner of the RCAF to serve Canada and Canadians when and where required.

Two days after the Minister's announcement, I had the privilege of being present at Kandahar Airfield, Afghanistan, for the stand down of the air wing. More than 150 airmen, airwomen, and soldiers were on parade to formally recognize the 32 months of support the Air Force had provided to coalition operations in Afghanistan. I am not sure if this was the first formal parade of the "new" RCAF, but the name change was certainly prominent in the various speeches. The individuals on parade had served in Afghanistan as part of Air Command, but were returning to Canada as members of the RCAF. They were representative of the thousands of Canadians who had donned Air Force blue (or green, or tan, or khaki, etc.) and, as noted in the original submission for the use of the "Royal" prefix in 1923, had "by their efficiency, gallantry, and devotion to duty added lustre to the name of Canada."<sup>1</sup> Regardless of our name, for the "big blue," it is very much business as usual.

Business as usual is what our readers can expect from the *RCAFJ*. With your contributions, the *Journal* will continue to serve as a mechanism for professional discourse from a historical, contemporary, and evolutionary perspective.



**Major William March, CD, MA**

*Senior Editor*

---

1. Correspondence from Acting Deputy Minister to Undersecretary of State for External Affairs, 5 January 1923, quoted from F. H. Hitchins, *Air Board, Canadian Air Force and Royal Canadian Air Force* (Mercury Series, Canadian War Museum Paper No. 2, Ottawa, 1972), in W. A. B. Douglas, *The Creation of a National Air Force*, Official History of the RCAF, Volume II (Ottawa: University of Toronto Press, 1986), 61.

# ULTRA-HIGH FREQUENCIES

*going once, going twice...*

By Major Patrick Hovis, CD

**W**OULDNT IT BE GREAT IF ALL THESE SOCIAL NETWORKING TECHNOLOGIES SUCH AS FACEBOOK, TWITTER, YOUTUBE, OR PODCASTING COULD ACTUALLY BE PUT TO PRACTICAL USE? WHY IS IT THAT WE CAN GET UP-TO-THE-MINUTE DETAILS FROM FRIENDS, OR ANY HOLLYWOOD OR MUSICAL PERSONALITY - SUCH AS WHERE THEY ARE, WHAT THEY ARE WEARING, AND WHAT THEY ATE FOR LUNCH - AT OUR FINGERTIPS AND ALMOST ANYWHERE IN THE WORLD, BUT TO COORDINATE A MAJOR EMERGENCY RESPONSE WE STILL HAVE CHALLENGES TO SHARING INFORMATION BETWEEN AGENCIES IN THE SAME AREA? INDUSTRY CANADA WILL BE MAKING A DECISION IN THE NEXT FEW MONTHS THAT COULD HAVE A MAJOR IMPACT ON THIS INTER-OPERABILITY AND INFORMATION SHARING ISSUE.

As of 31 August 2011, the band of radio frequencies in the ultra-high frequency (UHF) spectrum known as the 700 Megahertz (MHz) Band (698–806 MHz) was to be effectively freed up for the rapidly expanding world of mobile broadband communications. Industry Canada is to decide on how to divide this frequency spectrum and whether to auction off the whole band to communications companies or designate portions of the band for the use of public safety agencies, such as police, fire, and ambulance services, as well as emergency management organizations (EMOs) and response organizations, which include the Canadian Forces (CF).

Industry Canada opened a consultation period between 1 December 2010 and 28 February 2011 for interested stakeholders to submit proposals and comments on how best to use this highly valuable range of radio frequencies. As an indication of just how valuable this resource is, in the United States (US) this same process ended in 2009 with the US Federal Communications Commission (FCC) netting \$19 billion from 101 successful bids; their most successful auction process ever for wireless spectrum. They did, however, reserve two 5 MHz sub-bands, 763–768 MHz and 793–798 MHz, for public safety use, or more specifically, for public-private sector partnerships to develop public safety networks. Unfortunately, no successful bids or licence agreements have yet been made and the debate continues as to what to do with these frequencies. As a member of the Radio Advisory Board of Canada (RABC), an association of professional organizations that advises the government and Industry Canada on the use of radio spectrum, the CF, through the Director, Information Management Technology, Products and Services 5 (DIMTPS 5), has voiced its support on this issue by voting in favour of reserving spectrum for public safety use.

So what makes this particular frequency band so important, you may ask? The

700 MHz frequency space, which was previously used to broadcast analog television signals, happens to be the ideal frequency range that balances wide area coverage with high capacity and mobile services. Essentially, this means that the services you may receive on your smartphone, tablet device, or mobile internet universal serial bus (USB) stick could be provided to more people in more places, particularly in remote and mobile places, from fewer antennas or base stations. Since the main infrastructure already exists in most urban areas, the cost to expand or extend mobile communications services to rural or remote areas would be relatively low. As an example, one 700 MHz antenna can cover up to a 20-kilometre radius, compared to four to six antennas for a personal communications service (PCS) or global system for mobile (GSM), which operate in 800, 900, 1800, and 1900 MHz ranges, or up to 20 antennas for WiFi (wireless fidelity) or wireless local area network (LAN) operating in the 2400 MHz range. The 700 MHz frequencies can also penetrate most building surfaces, thereby further reducing costs for in-building infrastructure and coverage.

As one can imagine, this is a highly desirable resource for communication companies that are expected to offer large bids to get as much bandwidth as possible. What is important to the CF is that although we are not formally considered a public safety organization, we are a key stakeholder in emergency management and disaster recovery, and this is an opportunity to have a common communication means that could greatly improve information-exchange efficiency and effectiveness, therefore improving overall emergency preparedness, response, and coordination.

With a dedicated, high-capacity mobile communications means, Canada Command, Regional Joint Task Forces (RJTFs), search and rescue (SAR), military police, and other CF organizations that must coordinate with EMOs or public safety agencies, could use a



common network to share secure and non-secure critical information, such as real-time streaming video, high-definition graphics, and complex applications or databases. They would be able to do this from any smartphone, mobile device, or workstation that complies with the system standard. Currently, such a system or equipment does not exist, but major stakeholders in the public safety domain, such as Public Safety Canada, the Royal Canadian Mounted Police (RCMP), national police, fire and ambulance service associations, and provincial EMOs are developing proposals and business models to introduce this type of system, should the 700 MHz frequencies become available to them. So just as users can update their Facebook pages from their smartphones or computers, police forces, EMOs, and CF operations centres could use a similar type of application to monitor and update severe weather patterns, or terrorist and criminal threats, and send that information out over the public safety network (i.e., 700 MHz channels), thus ensuring the information is instantly shared and available to other interested agencies, specifically to forces on the ground or in the effected area. The overall effect would be improved situational awareness, better coordination, faster reaction times, and ultimately, more lives saved.

One of the major issues in Industry Canada's decision will be coordination or harmonization with US frequencies. The US band plan, meaning the separation of channels for most of the 700 MHz Band, was developed for the US market between 2002 and 2008, based around 6 MHz and 11 MHz channel widths. The problem with this is current wireless devices using the 3<sup>rd</sup> Generation Partnership Program (3GPP) standards, and the soon-to-be-introduced fourth generation (4G) standards, operate in 5 and 10 MHz channels. As a result, small portions of bandwidth will not be effectively used. Industry Canada must decide if the Canadian 700 MHz Band plan reflects the US plan or is optimized to limit wasted bandwidth. There are significant

economies of scale to be achieved if the US band plan were adopted in Canada, as the North American market could benefit from larger quantities, and therefore similar and lower-cost equipment. However, the US band plan, in addition to the ineffective use of some spectrum, will likely result in interference issues between adjacent channels. Modification options to the Canadian band plan are being considered that harmonize with the US plan to capitalize on the economies of scale, but limit interference and maximize use of the entire spectrum. Another option looks to harmonize with the Asia-Pacific Telecommunity (APT) band plan, which splits the entire band in half, with receive channels in the lower half and transmit channels in the upper half. Although this option is highly flexible, it limits interoperability with the US, which, as all expect, will be a significant factor in the final decision.

In addition to deciding on how to divide the 700 MHz spectrum, Industry Canada will decide whether to designate two 5 MHz channels (10 MHz) or two 10 MHz channels (20 MHz) for public safety use, or auction off the entire band to communications companies who would then lease back special services to public safety organizations. The preferred option from a public safety point of view is, of course, the two 10 MHz channels, as this will provide more bandwidth and therefore higher capacity services than the 5 MHz channels. The two 10 MHz channels also allow for expansion and introduction of future technologies in broadband services, and interoperability of a variety of mobile devices compliant with the 3GPP and 4G standards.

During most emergencies or crisis situations, the local communications infrastructure will essentially be overloaded by the media, the public, and many other interested parties not associated with the emergency management or public safety effort. Since all emergency services' communications and information systems are

now run on a net-centric or network-reliant infrastructure, public safety and emergency management authorities need to find ways to mitigate the effects of system overload. Even though 10 or 20 MHz of frequency space would not be adequate as the sole means to provide voice and data services for an entire emergency response, it could provide a dedicated means for critical information exchange that would not be affected by media or public demands for bandwidth. However, one of the considerations in the decision to designate spectrum for public safety is the effective use of the bandwidth.

In large urban areas, the entire bandwidth of either 5 or 10 MHz channels will very likely be used most of the time for the daily operations of police, fire, ambulance, and other essential services. In rural or smaller urban areas, however, it is understood that the requirement for public safety channels would mainly occur during a relatively large-scale emergency or crisis situation, thereby leaving those channels unused most of the time.

If you are with a communications company, you would probably feel it is best that your firm own the licences for these frequencies in order to provide additional services to rural areas but allow priority access and pre-emption services to public safety agencies during an emergency. If you are with a public safety organization, this may not be preferable, as the special priority services offered by these companies may not meet the emergency requirements. For instance, priority access privileges to a network mean that a call or data transfer request gets moved to the front of the queue to access the network, and anyone who is already on the network remains so and is not affected until they end their call. Pre-emption services, which cut off lowest priority callers in favour of highest priority callers, are also problematic as this service comes at a premium and is primarily meant for high-ranking individuals such as the Chief of the Defence Staff, chiefs of police, or senior officials.

Managing pre-emption services for an entire headquarters or multiple operations centres across government departments is something the communication companies can not yet handle, or may not be willing to undertake due to contracts or network availability agreements with their other clients. If EMOs or public safety authorities are designated as the licence owners of the channels, they will most likely investigate public-private partnerships for effective use of frequencies when not required for emergency management; however, the control of access and activation of emergency measures for those specific channels remains with the government or emergency management authority.

Although not a highly visible or well-understood topic by most, the decision on the 700 MHz spectrum may have a significant and long-term effect on the safety and security of Canadians. All consultations submitted to Industry Canada for this topic are available for public viewing on the department's website. Many people in the public and private sectors now wait anxiously for the final decision. ■

---

Major (Maj) Patrick J. Hovis is a Reserve Army signals officer currently serving as the J6 Plans at Canada Command Headquarters. Maj Hovis joined the Reserves as an infantryman in 1991, and transferred to the Communications Reserve, under the Reserve Entry Scheme for Officers (RESO) program, in 1997. He has served as a staff officer in Director Knowledge and Information Management (DKIM), Canadian Forces Information Operations Group (CFIOG) Headquarters, Deputy Chief of Staff, J3 Information Operations, Canadian Expeditionary Forces Command (CEFCOM) J5 Information Operations, and Director Information Management Engineering and Integration (DIMEI). Maj Hovis has also been deployed to Operation PALLADIUM and recently to Operation CROCODILE.

---

### Abbreviations

3GPP	3rd Generation Partnership Program
4G	fourth generation
CF	Canadian Forces
EMO	emergency management organization
MHz	megahertz
US	United States

# A PRIMER IN AIR MOVEMENTS

BASIC LOADS TO COMBINED AIR TERMINAL OPERATIONS  
AND BEYOND

BY CAPTAIN TONY JOHNSON, CD



## LOAD PLANNING AND THE INTERNET

**A**ir mobility experts, air movers in particular, love statistics. Monthly freight handled, amount of passengers through, number of pallets built... the list goes on. Sometimes, in the course of gathering these stats, some rather large figures turn up. Five million pounds (lbs)<sup>1</sup> is one example. This is a big number and it gets even bigger when you consider it against the inherent limitations of an aircraft's payload. Now, imagine 10 times that number.

There are many ways the armchair air mover can forecast what airframes he or she needs to move 5 million lbs from, say, Trenton to Winnipeg. A casual glance at Wikipedia reveals that the maximum payload capacity of a CC177 (C17) Globemaster is roughly 170,000 lbs or 1/30th of the above figure.<sup>2</sup> Digging a bit deeper, one can find out that the stipulated maximum takeoff weight of a Hercules CC130 (C130) is 155,000 lbs.<sup>3</sup> Using the above figures as a baseline, some quick math leads to the conclusion that it would require 30 C17s or 33 C130s to move 5 million lbs at any single moment in time. Throw the materiel on the planes and voila, the airlift planning stage is complete. This no doubt lends credibility to my aspirations of becoming a strategic planner.

Wait a minute. It seems obvious that a Globemaster is a bit bigger than a Hercules. How can they have such similar maximums? This is because the Wikipedia article does not take into account the fact that the casual reader does not even realize the differences between the two terms described, and furthermore, it ignores the principles of weight and balance and nationally implemented payload limitations. To make a more reasonable calculation, you also need to have a rough idea of the proper definitions, and many other factors need to be considered, such as compartment weight and height restrictions, which, in the case of the Hercules, are typically 10,000 lbs and 96 inches. Many more important calculations such as rigged versus load weight, compartmental differences, and the elimination of overhang also need to be considered.

Let us examine this a little further. First, let me explain a few terms. Maximum payload is not the trunk space in the back of a plane but rather a compounded figure based upon a series of relevant measurements that includes everything going on a dry airframe other than the aircraft itself. A more common term in figuring out the amount of freight that can go on an aircraft is the maximum allowable load. Simply put, this is the maximum total amount of weight, in addition to the normal operating weight of an aircraft, including crew plus fuel that can be successfully lifted off the ground. In the case of the C130J Hercules, the maximum allowable load is normally



CF Photo



37,500 lbs. The resulting figure achieved by combining the maximum allowable load plus the normal operating weight is known as the maximum take-off weight and is the ultimate tolerable weight of an aircraft that is still technically capable of taking off. This includes the airframe, crew, passengers, fuel, baggage and cargo. Also, contrary to the advertised Wikipedia maximum takeoff weight (155,000 lbs), 164,000 lbs and 175,000 lbs are the maximum peacetime and wartime takeoff weights of the C130J.

Another limit already exceeded was that of intrinsic pallet restrictions. A traditional 108-inch by 88-inch aircraft pallet only holds a maximum of 10,000 lbs. Therefore, to exceed this amount we are not only destroying our airframes but we're wrecking a lot of pallets, and inevitably, this is going to get 1 Canadian Air Division staff very concerned. So let's start again; this time I'll be quick so we can get on with the intent of this article. Bottom line: don't use Wikipedia as a source of information for strategic or tactical load planning—never for cargo, never for passengers, never for range, never, ever.

## GETTING LOADED

In order to more clearly exercise the 5-million lbs figure, I will consider the typical inherent equipment required to successfully contain the load on a plane and also what is in fact being loaded. To keep things simple, I'll use bottled water and 108-inch by 88-inch pallets. A full 330 millilitre (ml) bottle of water weighs exactly 1 lb and therefore we need to move 5 million bottles. There are 12 bottles of water in a case, measuring 10 inches long by 7 inches wide by 9 inches high, weighing 12 lbs and covering 70 square inches. Our pallet dimensions are advertised at 108 inches by 88 inches, but in actuality, they do not even measure up to their formal name. The actual measurements of the pallet are 104 inches x 84 inches and change. Using this number, it can be determined that the traditional aircraft pallet has a square surface of 8,736 inches. A few more small calculations and factoring

the ability to maintain the integrity of the case, it can be determined that 124 cases, or 1,488 bottles of water, can fit onto a single pallet layer.

For the remainder of this introductory lesson I will narrow the scope down to a single type of airframe, that of the C130J Hercules model. It is the newest aircraft in the Canadian Forces (CF) fleet and has already proven itself on operations, being deployed as part of the Tactical Airlift Unit in Kandahar. It has, in fact, 8 pallet positions and a very easy figure of 10,000 lbs to remember when trying to calculate load bearing capacity in the cargo compartment, except for positions 7 and 8, which are 8,500 and 5,000 lbs, respectively.

The next series of calculations is threefold, but by no means all inclusive. First is the height restriction. Using the 96-inch height restriction on a Hercules, we can determine that, initially, no more than 9 layers of our bottled water can fit inside the hold of the aircraft. Do the math and you come up with an absurd figure of 13,392 bottles of water per pallet. Given the previously mentioned term maximum allowable load, I hope some alarm bells just went off. The second calculation centres on compartment limits. This one pallet alone does not overload a Hercules, but it does, in fact, exceed compartment size and has the potential to wreck the airframe and pallet. Remember, a bottle of water weighs 1 lb and 13,000 bottles equals, well, 13,000 lbs. Eight pallets of water compared to the maximum amount of pallets a Hercules can hold would mean that we are now loading up a C130 with 108,000 lbs of H<sub>2</sub>O. Yikes! This may not go over too well, particularly on the ramp where, yes, you can fit a pallet, but with the inherent tensile strength of hydraulics and airframes, only 5,000 lbs and nothing higher than 77 inches can be positioned here. The last of the three considerations is restraint. Once inside the aircraft, the load will need to be secured via netting and straps allocated to hold down the load and prevent it from

shifting throughout the time it is within the plane's confines.

Rebuild pallets as follows: load the cases four layers high (cases stacked on top of one another, evenly distributed and laid in an alternating pattern) so that we top out at just under 6000 lbs for each<sup>4</sup> pallet and we'll only use 6 pallet positions so the last pallet position and ramp can be utilized to carry kit, maybe a couple of toboggans, and some food. Next, ensure the load is secured with netting and straps and we arrive at a grand total of 36,000 lbs plus crew and kit. And this is stretching it. Divide this into 5 million and you get 139, as opposed to our original number of 33. The conclusion is that it takes 139 individual flights to move 5 million lbs of bottled water from point A to point B at any time. Our problem didn't concern range at all, but you'll have roughly 32,000 lbs of fuel to get you wherever you need to go. We'll come back to the number 139 later on.

Here is some insight into the net payload delivered by "end ex." Five million bottles of water at 330 ml each equals 1.65 billion ml, or 1.65 million litres, enough water to fill a swimming pool two-thirds full if it were 50-metres long by 25-metres wide by 2-metres deep. In other words, two-thirds

of an Olympic-sized swimming pool full of water just cost a lot of time and money<sup>5</sup> to move from point A to point B. On a sliding scale, this demonstrates peculiar insight into just how little payload an aircraft can actually carry. The same amount of water could be shipped overland by 75 truckloads and would barely put a dent into the hold of an ocean freighter. Water is heavy, but the inherent limitations and proper use of limited aircraft payload is another story altogether.

## PRACTICAL DEMONSTRATION

Think again about 5 million pounds of freight and while you are at it, let us add 5,000 people to our problem and span the movement of this "freight" over a time frame of only two months. This is the amount of freight and passengers that was moved by CF aircraft from Canada to Haiti in roughly a two-month time frame in early 2010.<sup>6</sup> This event was dubbed Operation HESTIA and although the number of flights was a lot smaller since the Air Force utilized strategic assets (C17s), it is still quite an accomplishment for an air force of Canada's size. These are staggering numbers when taking into account that concurrent to this operation, the Air Force was supporting Operation PODIUM, Operation ATHENA, and



CF Photo: Sgt Frank Hudec

numerous other domestic and foreign initiatives. This was a one-off operation that stretched Canadian airlift capacity to its maximum and demonstrated the skill, commitment, and leadership of CF personnel at all levels, particularly the traffic technicians working out of 2 Air Movements Squadron (2 Air Mov Sqn—celebrating a diamond anniversary this year). Keep in mind that the vast majority of freight delivered by air was not water but rather critical materiel in support of one of the largest humanitarian operations in North American history.

Now, forgive me if you thought the intent of writing this article was to provide insight into the magnificent C130J and how it may have been a superior alternative to the C17 during Operation HESTIA. I don't have a slide rule capable of comparing the two capabilities and will leave that to those whose job it is to war-game airlift scenarios. The preceding text was in fact designed to set up you, the reader, for what comes next, that of being a part of the Canadian air movements footprint in the headquarters element of Kandahar Airfield (COMKAF)<sup>7</sup> in support of the North Atlantic Treaty Organization (NATO)-led International Security Assistance Force (ISAF) in Afghanistan. Caught your breath? In particular, now that we have some insight into some stand-alone aircraft and Canadian capabilities and limitations, it is time to focus on multinational operations ... with only a few digressions along the way.

## COMBINED AIR TERMINAL OPERATIONS

Now let's take the 5-million lbs figure from our earlier experiment with Operation HESTIA and double it. Now double this result again and add another million for good measure. The resulting number is the amount of cargo that is processed by the Combined air terminal operations (CATO) at Kandahar Airfield (KAF) as a steady state in a single month. Twenty-one million pounds of freight, in addition to 20,000

passengers, is the norm for this NATO movements organization that is manned by 30 military and 80 contracted staff on a 24/7 basis, 365 days a year, supporting both military and commercial aircraft ranging from Dash 7s to AN-124 Antonovs to C17 Globemasters. Think of it as a multinational air movements squadron.

Do you remember the 139 flights it took to move 5 million lbs of water? With the massive amount of factors surrounding the various missions air forces are employed to carry out, CATO handles approximately 700 aircraft a month. It is a staggering number when you consider the unit also assists several national support elements (NSEs) on any given day and that some air crews, particularly those of Eastern Bloc descent, normally do not call in on their approach to KAF and as a result, CATO is left scrambling to support. For now, a brief summary of how airlifted materiel gets from A (outside KAF) to B (inside the wire) and some interesting facts specific to the restriction and maintenance of "good flow."

Now keep in mind this is the sustainment of a warfighting capability we are talking about. Massive movements of personnel, ammunition, food, fuel, water, and associated materials to a land-locked air base in a land-locked country surrounded by mountains, desert, inferior roads, and worst of all, an enemy with members who wouldn't think twice about blowing themselves up to stop a truck from delivering boxes of napkins or skids of Coca-Cola™ to KAF. Yes, the majority of movements into KAF on a daily basis are via road from staging bases and domestic hubs strewn throughout Asia and the Middle East. Also, as far as Air Movements is concerned, CATO isn't the only show in town. The United States Air Force (USAF), Royal Air Force, Marine Corps, and several other militaries and contractors have all set up shop in KAF and all together account for the same amount of air freight and passengers that CATO handles.



All incoming fixed-wing flights related to the ISAF mission in Afghanistan are coordinated between the Allied Movement Coordination Centre (AMCC) in Eindhoven, Holland, and the various management authorities of the airfields, including KAF.<sup>8</sup> The AMCC's job is to collect shotgun blasts of flight requests from strategic staffs, air movement planners, civilian carriers, airfields, and other national authorities and to then collate and assign call signs and negotiate airfield slot timings based on move requests on a first-come, first-served basis. These are typically ironed out as early as 14 days in advance and as late as 24 hours prior to the estimated departure time of the flight. The resulting flight program is typically a living, breathing document, since changes in flights and flight cancellations and frequent payload amendments are the norm; in fact, most of CATO's planning is only ever done 24 hours in advance.

CATO, in itself, is presently capable of handling two strategic and two tactical

aircraft at any point in time. For example, a team of handlers can off load 36 pallets of food from a Supreme Boeing 747 out of Dubai, while another team simultaneously loads an AN-124 with sea cans for onward movement to a staging base somewhere in Europe. Concomitantly, a C130 intra-theatre passenger flight can be offloaded for reception, staging, and onward integration (RSOI) of persons as an AN-12 takes on a few tri-walls of spare parts destined for Bagram. Regardless of the size of the load, all of this can be handled simultaneously by CATO with the personnel and equipment in the present organization.

CATO is organized very much like a Canadian air movements squadron and rightly so. It is divided into several task-based sections all wholly dependent on one another in order to get the job done correctly and on time. It is currently led by the Chief CATO, a British squadron leader (Canadian major equivalent). The Canadian military element, made up of



CF Photo



a mobile air movements team based out of Trenton is broken up and scattered throughout the organization, undertaking roles such as ramp team lead, deputy chief, duty air movements officer (DAMO), cargo coordinator and operations staff. Keeping in mind a three-shift rotation, it soon becomes apparent that the 21-million-lb figure is accomplished daily by approximately 35 persons at all levels working throughout any single point in time. Success requires open communications, good infrastructure, and available equipment.

The main sections of CATO are broken down into three parts: Passenger Services, Cargo Services and Ramp Handling. All three are supported by the headquarters element, which includes an operations and planning section, led by the Deputy Chief, CATO. Further to this, the Chief CATO is represented by 24/7 DAMOs who monitor on and offloads and aircrew adherence to slot times. As you can well imagine, and to further complicate matters, an

operationally intense airfield such as KAF has a large amount of concurrent activities on the ramp on an almost continuous basis.

The passenger section is the most likely choke point related to smooth CATO operations in its current form. This highly active environment can be compared to the Christmas flight season in Canada, times a factor of 10. Two terminals, one for inbound and one for outbound passengers, and manned by CATO and American personnel on a 24/7 basis, have all the ingredients for issues to arise. For instance, the outbound terminal will never be able to hold more than two strategic flights' worth of persons at any one time due to its inherent capacity. This, unfortunately, does happen from time to time. Also, international flights, for example, Canadian C17 home leave travel assistance (HLTA) runs need to have passengers screened differently than an ISAF commuter flight to Kabul. Regardless, CATO gets the job done well and without grievance by performing a perpetual cat



herding ballet with commercial airlines, AMCC, Tanker Airlift Control Center (TACC), and other strategic and tactical flights, including having to deal with everyone from disgruntled generals to manic politicians. This is also one of the most culturally diverse sections, employing military and civilian persons from over a half dozen nations, including Afghani citizens working as part of the Afghan Border Guard.

The cargo section sorts and prepares all freight and paperwork for pickup by NSEs or ramp sections for onward delivery to their respective clientele. It is manned by four persons and currently maintains a small presence as the NSEs and other users are normally very efficient as far as freight build-up is concerned.

The ramp section is the most visible, and, arguably, the busiest section in KAF's terminal operations. It is organized into nine teams with three on each shift and they perform a variety of functions. They also operate an assortment of aircraft handling equipment based upon the diverse aircraft configurations faced on a routine basis.

Their main function is to transfer freight to and from CATO transient freight yards and out to designated aircraft, utilizing various heavy equipment such as K-loaders, split loaders, and forklifts.

"Wow, that's nice, Tony," you may say. "This article really helps me out a lot. All these front-end loaders, tractors, and excavators driving around on an airfield to help throw boxes inside planes. By the way, what is a K-loader?" Don't even try to find it on Wikipedia. A lovely piece of kit, the K-loader is a wheeled aircraft freight handling vehicle whose sole purpose is to deliver palletized freight over short distances to and from ramp-enabled military patterned aircraft such as the C130 and C17. They come in various sizes and configurations, the most common of which found in Kandahar is the K-40, entailing the fact that it can move roughly 40,000 lbs of palletized materiel at a time. They kind of look like someone took the rollers you see in the Beer Store and mounted them on an Argo and then put the entire concoction under a press and set on "bake" for five hours. Split loaders, not to be confused with the above, are similar devices



CF Photo: Sgt Roxanne Clowe

as they also transfer freight to and from aircraft. The main difference here is that they have a functioning “elevator” of sorts, which allows handlers to transfer freight in the form of unit load devices (ULDs)<sup>9</sup> and pallets to and from elevated decks of wide-body aircraft such as the airbus A-310 or Boeing 747 to ground-level equipment. I cannot describe it any better than that but must insist this equipment is crucial to proper cargo handling, and despite ill-timed mechanical breakdowns, this equipment is crucial to the smooth operational flow of air cargo.

Regardless, the ramp teams are tasked around the clock and typically handle (sometimes quite visibly) a cornucopia of freight and loads. They deal with such daily occurrences as garbage being dumped on the ramp out of the back of 737s as well as handling incoming freight apparently packed by the same crew that moved my household goods and effects last year from Winnipeg to Trenton. (Yes, I did receive ample compensation for that busted dining room chair.)

The operations and planning section is the nerve centre of CATO business activity. The persons tasked to this cell have a symbiotic relationship with the base operations centre (BOC), and in fact, they have personnel incorporated into this organization. All this effort so that flight arrivals, departures, delays, cancellations, parking, call ins (see above reference to former Eastern Bloc aircrews), and every other associated conceivable glitch related to prior permission requests (PPRs) is handled in a seemingly textbook manner. The persons working here are integrated into a fast paced operations environment, and they monitor and report on everything from AMCC slot timings to the safety concerns and immediate actions of all CATO personnel during indirect fire attacks on the airfield.

In a perfect world, CATO would be handling flights 24/7 and upping the monthly statistics by about 40 million lbs. However, in air movements, as in all logistical operations, many factors come into play, most of which seem to be perfectly designed to inhibit air flow.



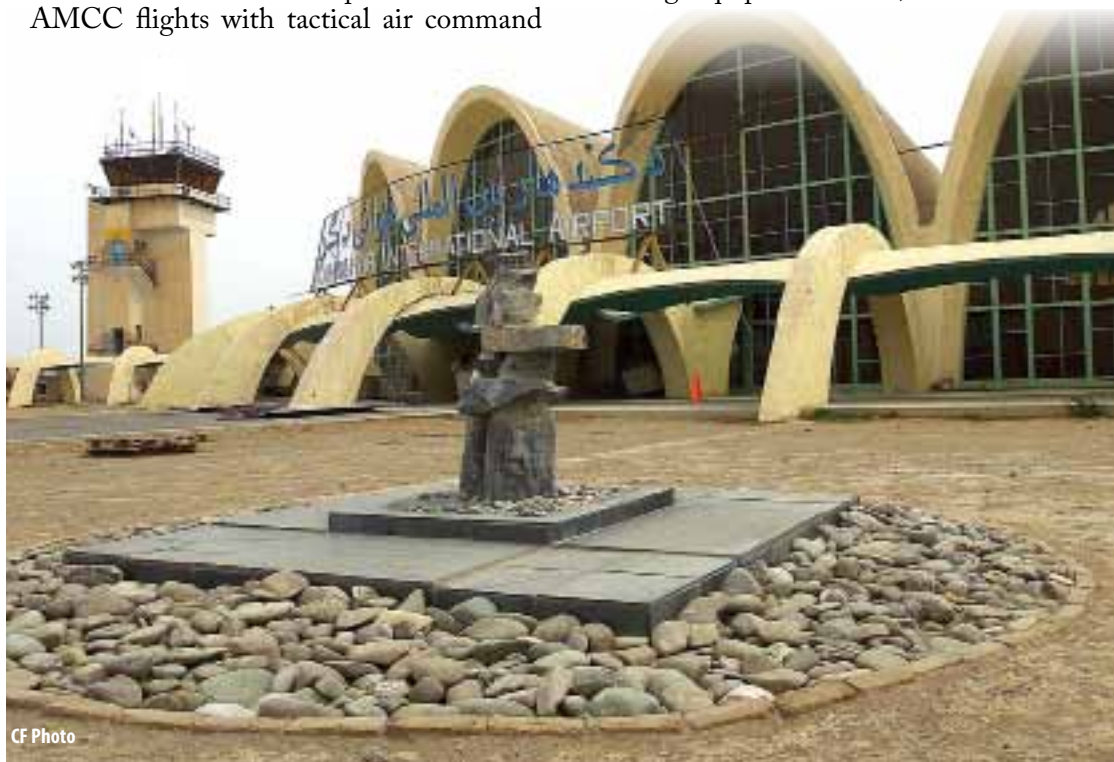


Kandahar Airfield in itself is a limiting factor, or a “choke point” in general terms. True, it is the busiest single-lane runway in the world, and true, it has gone through a vast modernization over the past eight years, but one must consider the fact that it is not solely dedicated to fixed-wing air mobility operations. No, that would be easy. It is actually a bit more complicated than that. Fixed-wing cargo flights, in fact, account for only a small percentage of all the monthly air traffic operations, over 35,000 of them, at KAF. Unmanned aerial vehicles (UAVs), helicopters, fighters, civilian charters (there is also an Afghan terminal using the same runway) and other operations make up the bulk of the traffic. There are not even enough letters in the alphabet to delineate one ramp from another at KAF. Let’s just say that over 25 active ramps surround the runway for the over 300 non-transient aircraft that are based here, and almost every minute of the day the sound of a jet, rotor, or turbo-prop engine roars past the CATO headquarters office. All the while, BOC personnel synchronize PPRs and attempt to harmonize AMCC flights with tactical air command

centre flights in line with national airlift authority intent.

Now for some surprisingly familiar territory: CATO has issues with maintaining the needed amount of serviceable aircraft handling equipment. Principally, there are too few pieces of kit on site to handle surges beyond the maximum on ground ratio of two strategic and two tactical aircraft. In addition, the original contract for air terminal logistical support was signed in 2006 when the operational tempo was significantly lower and primarily focused on Kilo ramp, adjacent to CATO’s main freight yard and hangar.

The increased tempo in day-to-day operations over the last few years has thus resulted in mass moves of freight from one side of the airfield to the other, a one-way route of over three kilometres. This is due to the expansion of cargo designated ramps on the opposite side of the runway. As those relatively familiar with aircraft handling equipment know, a K-loader is



CF Photo



not effectively designed to travel long distances, even less so when bearing a load. It is designed to quickly shunt freight to and from an aircraft and the staging or receiving points. It does not take long to realize that due to operating these pieces of equipment outside the parameters of what they were designed for, essentially using them as flat-bed trucks, has put significant wear and tear on the current fleet. The three split loaders and four K-loaders are accordingly plagued with a multitude of maintenance issues.

The quandary of increased ramp capacity has led to increased air traffic. CATO's little two-and-two handling capacity did not bode well for all concerned, and as a result, competition reared its ugly head. We are in a fledgling egalitarian society after all. DHL, FedEx, Gryphon Airlines, National Air Cargo, and NATO NSEs have all recently entered the KAF Air Movements business, and, presenting effective business plans, have managed to abscond rapidly, stealing some crucial business away from CATO.

Yet, even when presented with an array of handicaps, competitors, and other issues, CATO remains a premier air movements organization, meeting or exceeding all tasks thrown in its direction. But despite the assortment of air traffic it has been tasked to accept, CATO has ostensibly slept through the influx of traffic flying into KAF. Not quite wholly the truth.

## RENAISSANCE

The CATO mantra or mission statement is: "To serve as KAF's centralized coalition movements organization, providing efficient and effective passenger and freight handling services in support of the ISAF mission."

This mission has remained throughout the massive expansion at KAF and may have, in effect, resulted in CATO becoming a self-licking ice cream cone<sup>10</sup> in that the mandate to support has driven the organization to meet an increase in tasked operations brought upon itself by its very

openness to accept business. Potentially so, but the resulting opportunities must mean that it has to be President's Choice Chocolate Crackle™, too good to resist.

On 1 April 2011, a new contract was to come into effect, transforming the organization into an air movements squadron extraordinaire and initiating a revitalization that would culminate in almost tripling the current aircraft handling capacity of CATO. Forget about the two strategic and two tactical aircraft scenario from above. The next step, to be attained by the end of 2011, will be to handle five strategic and four tactical aircraft at any given moment in time. The end result will be a freight handling capacity that well exceeds the earlier claim of 21 million lbs. This time, think double 20 million and add 10 million for good measure.

The amount of CATO ramp crews will be doubling, organizational charts are evolving, and plans are being made to absorb more business from the apparently endless queue of flying organizations residing on or transiting through the ramp at KAF. The NATO Maintenance and Supply Agency (NAMSA) has been directed to supervise the implementation of this contract and has fully committed all possible resources to ensure its success. For instance, forget about four K-loaders. Think more along the lines of ten. The contract has vehicle lifecycle management considerations, including increases in handling rates, accounting for almost any scenario, except for the next war, of course. This increase in operations is further alluded to via the fact that the USAF Air Transport Operations Centre (ATOC) is currently handling roughly the same amount of freight as CATO but is planning on scaling back their commitment to ISAF and passing on the bulk of their workload to CATO. To put this into perspective, 16,000 American soldiers are typical of a relief in place (RIP) operation processed by ATOC staff. All the more business for CATO to absorb.

## SUM UP

Air movements is a particularly unique bird. Like all logistics operations in war, it is not a science, nor is it an art form but rather a complex arrangement of skill sets and capabilities that, when finely tuned, can result in the most magical of tasks being completed. Seemingly unimaginable amounts of freight and personnel can be transported with speed, versatility, and over vast distances in a short amount of time when required and organized by competent and dependable logisticians. Canadians have proven this time and again with the proven resilience of (tongue in cheek) strategic aircraft such as the C130 Hercules and through the undertaking of monumental airlift tasks such as Operation HESTIA with little or no notice. But this is not necessarily the best way to conduct business.

What can the Royal Canadian Air Force learn from CATO? Understand that CATO works and it works well beyond its intended scope. Like the Canadian military and many subset logistical organizations, it is often called upon to act outside its arcs and scrounge up solutions to outwardly impossible support tasks based upon an operational mission critical requirement. Learning from the past and realizing the importance of strengthening the logistical backbone of air mobility operations, NATO has injected a massive amount of equipment, manpower, and infrastructure into the organization; more so than is required by current operations, and, in fact, unbelievably, putting the cart behind the horse. Executing now upon the benefits of this foresight will ensure that the organization can be proactive in staging and training for future tasks as opposed to having to be reactive to the need.

Two important aspects of CATO definitely present a proof of concept as to how we can potentially improve the way we do business. First, they have combined the employment of military and contracted personnel together in a high tempo movements environment, and second, they have

invested in the proper tools, equipment and facilities necessary to get the job done.

The contractors, much like the reservists working at units all over Canada, provide motherhood guidance and wisdom to the experienced and rookies alike, and assist with routine procedures as well as cover for surge activities or when personnel are called to other tasks. At 2 Air Mov Sqn back in Canada, the CATO model is paralleled as the unit is called upon to provide 24/7 support on the aerodrome. Unlike CATO, however, it is also tasked to provide deployable mobile teams throughout the world with little or no notice. A reasonable solution would be to have a permanent fixed civilian workforce on the ground at 2 Air Move Sqn to augment the military presence.

Infrastructure and equipment, most importantly *modern* infrastructure and equipment, built to task facilities and vehicle (albeit abused) availability also ensure that the CATO mission will not fail. In Canada, it is evident that supporting equipment and infrastructure acquisitions sometimes come second to other priorities. Most of 2 Air Movements Squadron resides in a dilapidated, rundown array of hangars and temporary shelters not even originally designed for freight handling. Case in point, during Operation HESTIA, freight had to be "staged" in an area normally relegated to vehicle parking. The vehicles generally parked in this garage were consequently parked outside on the ramp, and as can be deduced, the operation ran into some mechanical issues related to environmental conditions. Forgive me if I get emotional here, but I have yet to see as beautiful a sight as two K-60s backed end-to-end and having freight pushed into the back of a C17 in one fell swoop. That represents a lot of water.

Fifty million lbs. As unreasonably high as that number seems, it is possible, given the right assets and a steady state air flow, that CATO in KAF will be ready to take on this number by 2012. Canadians are at

the pointy edge of the movements sword, navigating CATO through a resurgence in attractiveness as the organization transforms itself in line with the KAF's role as the largest NATO airbase in Afghanistan. The knowledge gained from our role here will no doubt aid with a renewed outlook at air movements operations from our CF domestic air hub in Trenton.

One final statistic: 50 million bottles of water stacked one on top of another equals 37,500,000 feet or 7100 miles. As the crow flies, that's the distance from Toronto to New York City and back 10 times or one trip from Toronto to Kandahar. Or 19,000 CN Towers laid end to end. Happy calculating. ■

Captain Tony Johnson was raised in Cornwall, Ontario, and is a logistics officer posted to 2 Air Movements Squadron in Trenton. He enjoys spending time with his wife Heather and getting stressed watching his two sons, Stuart and Thomas, play hockey. He likes hunting, fishing, drinking beer, and the Montreal Canadiens.

**Abbreviations**

air mov sqn	air movements squadron
AMCC	Allied Movement Coordination Centre
ATOC	air transport operations centre
BOC	base operations centre

CATO	Combined air terminal operations
CF	Canadian Forces
COMKAF	Commander Kandahar Airfield
DAMO	duty air movements officer
ISAF	International Security Assistance Force
lbs	pounds
ml	millilitres
NATO	North Atlantic Treaty Organization
NSE	national support element
PPR	prior permission request
USAF	United States Air Force

**Notes**

1. Air Movements uses the imperial system of measurements. Therefore, metric conversions have not been included in this article.
2. "Boeing C-17 Globemaster," Wikipedia, [http://en.wikipedia.org/wiki/Boeing\\_C-17\\_Globemaster\\_III](http://en.wikipedia.org/wiki/Boeing_C-17_Globemaster_III) (accessed September 19, 2011).
3. "Lockheed C-130 Hercules," Wikipedia, <http://en.wikipedia.org/wiki/C-130> (accessed September 19, 2011)
4. The exact number is 5952, but who's counting?
5.  $32,000 \times 139 = 4,448,000$ . That is a rough estimate of fuel expended. \$5 million seems like a reasonable "at pump" price for F-34.
6. "Fact Sheet: Operation HESTIA and Joint Task Force Haiti," CEFCOM, <http://www.cefcom.forces.gc.ca/pa-ap/ops/fs-fr/hestia-eng.asp> (accessed September 19, 2011).
7. COMKAF is an acronym for the term Commander Kandahar Airfield, currently USAF Brigadier General Jeffrey B. Kendall, responsible for the operational efficiency and readiness of Kandahar Airfield.
8. "Home- AMCC ISAF Site", AMCC ISAF Site, <https://amccisaf.nc3a.nato.int/default.aspx> (accessed September 19, 2011).
9. A unit load device (ULD) is a container used to load freight and baggage on to an aircraft. They come in various shapes and sizes and simply put, reduce handling time by being pre-filled with smaller items prior to load or unload of aircraft. They also allow for segregation of freight by destination.
10. "Self-licking ice cream cone" describes a self-fulfilling prophecy.



CF Photo: Cpl Brandon O'Connell

# THE AIR HISTORIAN

BY HUGH HALLIDAY

PART II





*Editor's Note: Part I of this article examined the role/position of the Air Historian for the Royal Canadian Air Force (RCAF) during the Second World War and appeared in the Summer 2011 issue of The Canadian Air Force Journal. Part II picks up the story almost immediately after the war.*

The following is adapted from a paper presented by Hugh A. Halliday at the joint meeting of the Air Force Historical Conference and the Canadian Aviation Historical Society annual meeting, Winnipeg, June 2006. Further insights on the subject may be gained by consulting a recent work by Tim Cook, *Clio's Warriors: Canadian Historians and the Writing of the World Wars*, (Vancouver, University of British Columbia Press, 2006).

## THE STRUGGLE IN THE WILDERNESS

The man who inherited this wreck was Wing Commander (W/C) F. H. Hitchins, and in 1946–47 even his position was uncertain. He had moved to Ottawa and bought a house, expecting that the position of Air Historian would be permanent. He even resigned a teaching position to take up the job. In 1946 he proposed that a proper RCAF history be compiled, consisting of at least eight volumes and including the First World War, interwar period, and the most recent conflict. Yet the annual *Report of the Department of National Defence for the Year Ending March 31, 1947* blithely noted completion of the third volume of *The RCAF Overseas*, then went on to say: "No official history of the RCAF will be published, although the final volume of a four-volume history under preparation by the Army Historical Section will include a survey of the administrative history of the RCAF."<sup>1</sup>

Hitchins' hopes were further dashed when, in 1947, a ministerial edict declared that all historical work was to cease, effective 1 April 1948. The Minister of the day (Brooke Claxton) was convinced that no one would be interested in Canadian military history after 1948. Hitchins and his assistant, Squadron Leader H. H. Coulson, were to be let go as of September 1947, which led to both officers lodging grievances with

the department. The Chief of the Air Staff (Robert Leckie) was dismissive of the grievances raised by Coulson and Hitchins and said so to the Minister of National Defence. He agreed that they had been given certain assurances in 1946, that they had made important decisions based on those assurances (including resigning university teaching posts), and even went so far as to write, "I consider the grievance of these two officers to be one which merits consideration." He promptly declined to address the matter:

I feel that this is one of those cases where a change of policy has had an unfortunate sequel for the individuals concerned but that it would be wrong to change the policy as a means of satisfying the grievance. The request for an audience by these two officers is almost certainly inspired by the successful plea of the Army Historian for consideration of his case.<sup>2</sup>

Leckie's willingness to abandon the historians clearly encouraged the Minister to persist in his decision. On 20 June 1947, Claxton himself wrote a memo to his Deputy Minister:

With reference to the applications for redress of grievance of W/C Hitchins and S/L [Squadron Leader] Coulson, it would, I think, be quite out of the question to provide permanent posts for these officers. All the universities are short of historians. This being so, it seems to me that the best thing in their own interest for them to do would be to leave at some date to be agreed upon, either the 30<sup>th</sup> September 1947 or 31<sup>st</sup> March 1948.

First, however, they should complete the third volume of "The RCAF Overseas" and put all the other material they have in good shape for its being used by the Historical Section. If they got through

“The RCAF Overseas” in good time, they might work at the RCAF parts of the General History of the War, as well as at putting the material they have in the best possible shape.<sup>3</sup>

Coulson was let go in September 1947. Hitchins was also formally retired to the Class “E” Reserve, but he was permitted to remain as a “temporary civil servant.” This must have been a period of agonizing limbo. At least one senior officer recognized, in part, the folly of closing down the Air Historian’s office. Air Commodore R. C. Ripley (Assistant Chief of the Air Staff) argued for a re-establishment of the Air Historian, even if it meant disguising the move by changing the name of the office. Its role, however, was to be very limited.

It is felt that the Service should not be producing popular-type histories for public consumption but should be producing histories as texts for the RCAF or other services.<sup>4</sup>

The RCAF finally decided that, at least for training, it did need an Air Historian. Fred Hitchins was granted a permanent commission in the rank of Wing Commander (Administrative Branch), effective 1 April 1948, then left him to his own devices.

For years thereafter the office of Air Historian consisted of Hitchins alone and one clerk/typist. He began a long campaign to convince his superiors that history mattered. RCAF units still generated historical reports; Central Registry still kept files containing historical information—files that should be reviewed by the Air Historian before they were transferred or destroyed. There were still queries from other governments, from parliamentarians, and from the public. Finally, there were some 60 cabinets stuffed with documents (many of them hastily packed and shipped from overseas) that needed to be sorted and catalogued.

A proposal in August 1947 that the Department of National Defence establish an “Inter-Service Historical Section,” effective 1 April 1948, might have saved RCAF history, but a decision was repeatedly deferred. When it was finally considered by the Chiefs of Staff Committee (February 1948) it was concluded that a tri-service Historical Section would be deferred until such time as the Army histories had been completed. Until then, the Air Force and Navy were on their own.

Air Marshal W. A. Curtis (Leckie’s successor as Chief of the Air Staff) expressed a passing interest in RCAF history, but only so far as it could be taught in RCAF schools. Curtis, to his credit, acknowledged the need to catalogue existing records, and it was he who had confirmed Hitchins in his post. However, the new CAS showed no interest in compilation of an RCAF history, though he conceded that the Air Historian might “cooperate with and assist the Army Historical Section in the compilation of the RCAF material required for the official military history.”<sup>5</sup> He clearly expected, well into 1948, that the Army Historical Section would still have substantial RCAF content in their military histories (up to one-third) and expected that Hitchins would “cooperate and assist the Army Historical Section.”<sup>6</sup> Otherwise, he committed no RCAF resources—dollars or people—to an RCAF history.<sup>7</sup>

When the concept of a tri-service historical section collapsed, there was still time to introduce some discussion as to how RCAF history was going to be handled. Instead, there was a profound, even deafening, silence. Wing Commander Hitchins was given no further directives or instructions—he had to do what he could with what he had. Nobody seemed to care very much what happened.

The official, even wilful, ignorance about the Air Historian was reflected in several

ways. As of 1948, when the Air Historian was finally accepted in the post-war Air Force Headquarters (AFHQ), it reported to the Chief of the Air Staff (CAS). As of September 1951, this was changed to the Vice Chief of the Air Staff. In February 1956, the Air Historian was moved to the realm of the Air Member for Personnel. Each of these changes moved the Air Historian further away from the centre of AFHQ, further to the periphery of bureaucratic power. Administrative isolation was matched by physical seclusion, for while the most important functions of AFHQ were housed in sprawling “Temporary Buildings” on Elgin Street (Cartier Square) and Carling Avenue, the Air Historian was located (with other obscure units) on Victoria Island. Its most sympathetic neighbour was the two-man / one-typist office of *Roundel*.<sup>8</sup>

The nadir of the Air Historian was reached about 1951–1952. Air Vice-Marshal F. R. Miller admitted in writing that he could not compose an informed assessment of Hitchins because he did not know what work he did, much less how well he did it.

This silence was broken on 2 May 1953 when Hitchins himself addressed a long memo to the Assistant Vice-Chief of the Air Staff. It was evident that he was being overwhelmed with duties, yet his staff still consisted of a single clerk/typist. His two-man band had numerous tasks to perform, and he clearly was not able to keep up. These tasks fell under three general headings:

**Records Management:** The 60 cabinets of wartime documents remained uncatalogued; meanwhile, unit historical reports (of varying quality) were still arriving, having to be checked and filed. Files slated for destruction had to be reviewed to ensure that valuable documents were not mindlessly discarded—and the evidence is that, for all his intentions, Hitchins was unable to preserve many files from zealous Central Registry cleaners.

**Historical Research:** This included handling inquiries from parliamentarians, ministers, senior officers, and the Army Historical Section, responding to unit requests for “brief” histories, determination of unit battle honours, and revision and updating of study material for Training Command. In the course of this work, he had been compelled to concentrate on service requests, leaving many others (including aspiring authors) to fend for themselves.

**Miscellaneous:** This included approval, custody and photography of unit badges, lectures at Staff College and Reserve Schools, contributing to *Roundel* (established 1948), attendance on the Public Records Committee, and administration of his section.

In the period 1948 to 1953, Hitchins had been doing some remarkable work, yet assessments of his performance reflected the utter indifference of his superiors to his role. In 1949, he had produced, practically single-handedly, a chronology of the RCAF to that date, and he kept it up to date so that two mimeographed supplements were printed before he retired. He wrote *Among the Few*, the first study of Canadian and RCAF participation in the Battle of Britain. He drafted histories for use in officer candidate schools. He kept notes on interwar personnel and compiled handwritten drafts of pre-war squadron histories that never got to the stage of typing, but which are found to this day throughout air force history files.

Hitchins kept a candle burning for RCAF history when all about was darkness, and he was well aware of that darkness. Shy and quiet, lacking both the dynamics and the networks of a C. P. Stacey, he could not move mountains. The idea of a comprehensive RCAF history had vanished from sight—at a time when the Army Historical Section had some 60 personnel. Hitchins requested help—at least one more officer—and

AFHQ began looking at his request, but not at his mandate.

Hitchins again raised the need for a comprehensive RCAF history (11 December 1953) and put forward a plan for one (31 March 1954). On 4 June 1954, a memo from Directorate of Organization and Establishments declared, "The Air Members have approved the publication of an RCAF History."<sup>9</sup> It was expected to take three years and the strength of the office of Air Historian was doubled—from one officer (Hitchins) to two (Hitchins and Flight Lieutenant A. P. Heathcote). That was all.

His superiors continued to have little or no appreciation of his work beyond what appeared in *Roundel*. Consider the following assessments, written three years apart:

Wing Commander Hitchins appears to be doing a satisfactory job and always seems to have the answer to any problems or questions raised in regard to Air Force history. He does not seem to have too much imagination and his writings are not very inspiring or colourful. However, in a historian this is probably a good thing.

Air Commodore C. H. Greenway, 11 July 1956

My contact with the Air Historian is relatively limited. However, I find him to be a sincere, intelligent and sensitive officer. He is quite capable of finding facts in research of material and writing them in an imaginative and logical manner.

Air Commodore J. G. Stephenson, 1 February 1959.<sup>10</sup>

At this point we find in the files a remarkable letter dated 5 October 1956. It was from Air Marshal Roy Slemon (CAS) to Lieutenant-General H. D. Graham (Chief of the General Staff), and it bears transcription in its entirety:

Dear Howard;

I am grateful to you for having made available to me a copy of Volume 2 of the Canadian Army's official history of the Second World War - "The Canadians in Italy".

In a spare moment the other evening I picked the book up with the intention of casually leafing through it but became so absorbed that I read far into the night, at the expense of some work which I had to do. I intend to continue the exploration whenever the opportunity permits.

Volume 1 - "Six Years of War" is also a masterly effort which I have enjoyed. I must congratulate the Canadian Army on the excellent way in which it has handled and is producing a worthwhile and interesting history of its Second World War efforts. You people have done exceptionally well in this matter whereas we, the RCAF, in my opinion have failed. For this, I am afraid that I must personally accept a fair share of the blame in that I didn't fight as hard as I should have for adequate support for the RCAF Historical Section. Obviously, your historical people have had the support they deserve for their important task.

Again, my sincerest thanks to you for your kind thought of presenting me with this fine history.

(signed by Roy Slemon)<sup>11</sup>

It would be pleasant to record that Slemon, having seen the light and admitted his errors, would have been converted like Saul on the road to Damascus. In practical terms, his input may be described in three words: "Sweet Fanny Adams".

## TOKEN EXPANSION

The "new boy," Flight Lieutenant (later Squadron Leader) Heathcote, was a



tremendous asset to Hitchens, enabling the Air Historian to start writing a scholarly history of the interwar RCAF and to assist other writers in their efforts to produce books. The peacetime history was never published by the Department of National Defence, although it was produced in 1969 by the Canadian War Museum under the title of *Air Board/CAF/RCAF, 1919–1939*. Cooperation with authors was most conspicuous as the 50<sup>th</sup> anniversary of Canadian flight approached, culminating in Leslie Roberts' survey history, *There Shall be Wings*, which owed much to assistance from the Air Historian.

Yet Heathcote was a man of limited outlook. He had been a Halifax bomber pilot during the war, had rejoined the force as a pilot in 1948, and been reclassified for non-flying duties in 1955. His specialty was writing squadron histories which appeared in *Roundel*, and the more he tackled these projects the longer they became. His talent lay in narrative, but not in analysis. In 1961, when the official history of Bomber Command appeared, he did not bother to read the volumes before condemning them as disrespectful of bomber crew sacrifices.<sup>12</sup> Heathcote, in short, had a blinkered view of history, shaped and warped by his own experiences and unwilling to abandon the orthodoxies of his youth.

It was about this time (1954–1955) that Air Historian staff were reclassified from “Special List” to “Pers/PI” (Personnel / Public Information), a trade that encompassed Public Relations (PR) staff. It happened that Air Force PR was a particularly dynamic organization, but it jealously guarded its own establishment and only grudgingly surrendered a body here or there to the Air Historian. In March 1957 another officer was brought in—Flight Lieutenant L. R. N. Ashley—but the Director of Public Relations (DPR) clearly intended him to replace Heathcote, not augment him. In the end, Ashley moved

on, Heathcote remained, but a former Education Officer was added to the section—Flight Lieutenant Fred Hatch.

## THE MANNING YEARS

Hitchens had reached retirement age in 1955, but it was suddenly realized that he was not easily replaced. His service was extended repeatedly. In the spring of 1960, he finally retired, to be replaced by Wing Commander Ralph Manning, who asked for the job as far back as 1958 and had turned down a promotion so that he might become Air Historian. Manning held only a Bachelor of Arts (BA), and as a historian he was more an enthusiastic dilettante than a professional scholar. He nevertheless brought to the office a fresh face, some new ideas, and a determination to increase the staff of the office. In the next four years, he generated a series of memos and proposals outlining the need for an official history, the scope of such a history, and the staff required to bring it to fruition.

It is not clear why Wing Commander Manning had sought the post or what vision he may have had for the office. Once in the post, however, he became enamoured of the concept of an air force museum, and set about assembling one. Several Second World War aircraft that had been stored and forgotten at Chater, Manitoba, were rediscovered and brought to Ottawa. He began casting about for added machines, and was approached by one George Maude (Saltspring Island), who wrote saying that he had a Bolingbroke that the RCAF was welcome to have. An officer was sent west, examined the machine, pronounced it good, and arrangements were made to raft it off the island and bring it to Ottawa. Manning established contacts with Ken Molson (the National Aviation Museum), Lee Murray (Canadian War Museum) and Malcolm S. (Mac) Kuhring (National Research Council). These four could be considered the fathers of today's Canada Aviation Museum.

Meanwhile, the staff of the Air Historian's office grew slightly—almost accidentally. The first addition was Flight Cadet Hugh Halliday, who served in the section for two months in 1960 and wangled his way back (with Manning's connivance) in 1961. Flight Cadet Halliday became Flying Officer Halliday in July 1961, and plunged into various tasks, including writing *Roundel* articles and serving as secretary to a Museum Aircraft committee.

All this was gratifying, but it was NOT getting an RCAF history written. It was NOT getting those cabinets of documents catalogued. It was letting some things slip badly (notably monitoring of semi-annual historical reports).

Certainly, Ralph Manning was trying to enlarge his establishment; in January 1961, he proposed that Air Historian be enlarged to six officers, one civilian historian, one sergeant clerk, and two civilians for administration and typing. For a brief moment it looked as if he was going to win his point. The Air Member for Personnel (Air Commodore W. A. Orr) addressed a memo to the CAS (14 August 1961), suggesting adoption of Manning's plan, pointing out at the same time that the Naval Historian even then had 9 persons on staff, the Army Historical Section still had 32.

The existing AFHQ establishment was full, however. The enlarged Air Historian office could be accomplished by transferring people from other sections (but nobody was volunteering any bodies). Alternatively, AFHQ establishment could simply be increased by six persons. The word came down from the CAS on 31 August 1961: "The CAS has no objection to you [Orr] increasing the establishment of the Air Historian, but he **will not** authorize an increase in the AFHQ establishment to achieve this end."<sup>137</sup>

This put-down did not end Manning's efforts; a memo dated 22 March 1963 was only one of many he signed. This one

recommended eleven, including three clerical staff. And not long afterwards he suggested a nine-volume history of the RCAF, which would have included one volume dedicated solely to No. 6 Group, one dedicated to the British Commonwealth Air Training Plan (BCATP), one dealing with "The Lost Legions" (RCAF personnel serving with the Royal Air Force [RAF]) and one of post-war history ("Keeping the Peace"). At the same time, however, he was having to deal with new challenges. The prospect of integrating the three service historical sections was raised in March 1962 by an internal Manpower Study Group. This was soon followed by Glassco Commission on Government Organization—the first step in the road to service unification and integration. Manning had to spend much time explaining and justifying the existence of his section. The Glassco Commission was critical of all service historical sections, which as a body it considered bloated in comparison with the Public Archives of Canada. It scarcely mattered to the commission that one tree was stunted in what was otherwise deemed to be a congested forest.

The staff situation was one of flux. Early in 1962, the section acquired a civilian writer, Ronald V. Dodds, in peculiar circumstances. Dodds had, for many years, been Director of Public Relations at AFHQ, but in 1958 he had proceeded to No. 1 Air Division to assume PR direction there; during his NATO tour he held the rank of wing commander. Upon his return to Canada he reverted to civilian status, but his former post of DPR had now been occupied by a serving officer, Wing Commander (later Group Captain) William Lee. The question of what to do with Ron Dodds was resolved by sending him to the Air Historian.

The acquisition of Dodds was offset by the loss soon afterwards of Art Heathcote, who was reclaimed by DPR and assigned to PR duties. It was a most unhappy situation for Heathcote, who personally disliked many of

his new colleagues and considered himself a historian rather than a PR hack.

The curious thing is that neither Heathcote nor Dodds were historians in the true sense. Neither was Ralph Manning, while Flying Officer Halliday had only a general BA (though he was working towards a Master of Arts in Political Science). From the retirement of Hitchins (1960) to unification (1965) the only true historian on staff was Flight Lieutenant Fred Hatch.

## DEMISE AND REBIRTH FROM AIR HISTORIAN TO DIRECTORATE OF HISTORY

Integration rushed forward in 1965. *Roundel* vanished that year (along with the *Canadian Army Journal* and *Crownsnest*), to be succeeded by the tri-service *Sentinel*. Wing Commander Manning retired, and the moving vans arrived at Victoria Island to transfer the personnel and files of the Air Historian to Besserer Street and incorporation into an integrated Directorate of History, headed by C. P. Stacey (brought out of retirement).

The new organization was soon busy at producing a military history of the Canadian forces for 1967 (Centennial year), and this came out on time as a particularly handsome book, *The Armed Forces of Canada, 1867–1967*, written by staff of all three former sections, but honed, refined and edited by Lieutenant-Colonel D. J. Goodspeed. Even as this went forward, however, attention turned to sorting and cataloguing RCAF records, the first step towards producing the long-delayed official Air Force history.

A draft of the first volume, covering the First World War, had been started in 1962 by Ron Dodds, and parts of it—dealing with the Royal Flying Corps / RAF training scheme in Canada and with the operations of No. 3 (Naval) Wing—had already appeared in *Roundel*. Nevertheless, Stacey looked at the draft and rejected it immediately as inadequate. It was the work

of a journalist, not a scholar. It failed to address issues of policy. It was derivative in outlook. It lacked footnotes and references. It was literate, entertaining, but not at all insightful. The process of writing Volume One would have to begin all over again.

The rejection of his manuscript was a devastating blow to Dodds, whose egotism was almost matched by his contempt of the scholarly approach. For the next five years he became a man waiting for his retirement and pension. His rejected draft would remain in a drawer until his retirement, when he published it under the title of *The Brave Young Wings*. Its deficiencies as an official history become evident when one compares it with S. F. Wise's *Canadian Airmen and the First World War*, which went back to historical roots and pointed the way to the next volumes of an official history that the pre-integration force had long needed and never really wanted.

With the false pride of a non-flying air force officer, Flight Lieutenant Halliday also felt initial resentment at integration, but he was quickly brought into the writing and production of *The Armed Forces of Canada* where he was tutored by Goodspeed. The cataloguing of RCAF documents proved tedious, and was to some degree obstructed by Dodds until S. F. Wise (Stacey's successor) pressed for its completion, at which point the process moved from excessive detail to excessive haste. First studies for *Canadian Airmen and the First World War* were well in hand by 1968, and Halliday himself was learning more about the historical process from Goodspeed and Wise than he had ever absorbed in his years with Air Historian. His departure from Directorate of History in July 1968 was motivated by complex reasons (some of them mistaken), but frustration was not among those reasons.

## IN CONCLUSION

In reviewing the history of the Air Historian, one quickly concludes that the RCAF never took history or the office

seriously. If there is a major villain, it is Brooke Claxton, the Minister of National Defence who, as of 1947–48, was so dismissive of all military history. Yet he was abetted by four successive Chiefs of the Air Staff—Leckie, Curtis, Slemon and Campbell—who were equally indifferent to an independent history of the force, distinct from that of the Army and the RAF. When people complain that the Air Force history (by Wise, Douglas and Greenhouse) was 30 years too late, one can only recall the words of Pogo: “We have met the enemy and he is us.”

By the same token, the cause of air force history was better served by an integrated Directorate of History than by the office of Air Historian that AFHQ had hobbled and ignored. If there is a hero in the story of the Air Historian, it is the solitary F. H. Hitchins, quietly preserving and working to inspire, waiting for better days and enlightened leaders. If ever a man deserved posthumous recognition, it was he, and his induction into Canada’s Aviation Hall of Fame in 2007 was a worthy tribute to a scholar, officer, gentleman, and guardian of the history we honour today. ■

Hugh Halliday is a former member of the RCAF, a historian and author with numerous books and articles to his credit. One of his more recent works, entitled *Valour Reconsidered: Inquiries into the Victoria Cross and Other Awards for Bravery* (2006), examined how major gallantry awards were bestowed.

**Abbreviations**

AFHQ	Air Force Headquarters
BA	Bachelor of Arts
CAS	Chief of the Air Staff
DPR	Director of Public Relations
PR	public relations
RAF	Royal Air Force
RCAF	Royal Canadian Air Force
W/C	wing commander

**Notes**

1. Report of the Department of National Defence for the Year Ending March 31, 1947 (Ottawa, King’s Printer, 1947), p.57.
2. Leckie to Claxton, 4 June 1947, in RCAF file 19-15-37, “RCAF Historical Section – Organization and Establishment,” Library and Archives Canada (LAC), Record Group (RG) 24, Volume 5231.
3. Claxton to Deputy Minister, in RCAF service file of F. H. Hitchins.
4. Ripley to AMAP, AMOT and AMP, 23 February 1948; in RCAF file 19-15-37, “RCAF Historical Section – Organization and Establishment,” LAC, RG 24, Volume 5231.
5. Curtis to the Minister of National Defence, 6 March 1948, in RCAF file 895-DAFH, “Organization and Establishment, Director of Air Force History,” LAC, RG 24, Series E-1-c, Accession 1983–84/216, Volume 2967 (hereafter referred to as File 895-DAFH).
6. Ibid.
7. Ibid.
8. When this writer first encountered Air Historian offices they were in an H-Hut on Victoria Island. About 1963 the offices were relocated to a renovated former seaplane hangar on the eastern end of the island - not far from where a totem pole now stands. The *Roundel* offices were in a stone hut immediately east of what is now a fire-gutted mill; the mill itself had accommodated the RCAF personnel records and identification bureau.
9. Wing Commander H.G. Marriott to Director of Organization and Establishment, 4 June 1954, file 895-DAFH.
10. Both passages are from longer statements in Hitchins’ personal RCAF file.
11. Slemon to Graham, 5 October 1956, file 895-DAFH.
12. Sir Charles Webster and Noble Frankland, *The Strategic Air Offensive Against Germany, 1939-1945* (London, HMSO, 1961).
13. Memo, AMP to CAS, 14 August 1961 with minutes from CAS to AMP, 31 August 1961, file 895-DAFH.





# what air forces do

by Lieutenant-Colonel Brian L. Murray, CD



Note: The following views are solely those of the author and do not necessarily reflect the policy or the opinion of any agency, including the Government of Canada, the Canadian Department of National Defence, the Government of Australia, and the Royal Australian Air Force.

If a nation's air force, military, public, or government does not clearly understand what unique services the air force provides for the nation, the capabilities the air force needs to provide those services become difficult to acquire. One of the tools the military uses to explain its *raison d'être* and core functions is doctrine. Current *Canadian Forces Aerospace Doctrine* describes air force functions using names that were spawned from army operational function terms and were aligned with joint force development terms, which do not, in this author's opinion, adequately explain what the Royal Canadian Air Force (RCAF) fundamentally does.

The aim of this article is to advocate the use of simple, clear, intuitive, and understandable words to describe what the RCAF does in *Canadian Forces Aerospace Doctrine*. The current trend to use conceptual doctrinal jargon to describe RCAF functions, while serving secondary considerations, inhibits basic understanding of what the RCAF exists to do, and therefore makes the identification, prioritization, and justification of the capabilities the RCAF needs to fulfil its purpose more difficult and less effective. The RCAF needs to understand and formally recognize its fundamental aerospace power functions, and it needs to clearly communicate these functions.

After describing the factors affecting what the RCAF does, the role of doctrine and the requirement for clarity in strategic aerospace doctrine, this paper will discuss the current functions of the RCAF, the origins of these functions, and the fundamental aerospace power functions that have emerged from air warfare experience over the last hundred years. Additionally, it will be shown that unity of strategic military effort can be maintained while the way land, sea, and

air forces conduct war and define their war fighting functions can and should be significantly different. Finally, this article will recommend the RCAF modify the way it identifies its functions to clearly highlight the fundamental, enduring aerospace power functions (the reasons why the RCAF exists), while retaining strong links to overall Canadian Forces (CF) capability development terminology.

### Factors Affecting What the Royal Canadian Air Force Does

Among the many influences affecting what the RCAF does, two stand out: government direction and military direction. In general, government direction involves defining what the CF and RCAF must do for the nation, and military direction dictates how those objectives can and should be achieved. These influences do not act in isolation, and indeed, military commanders play a crucial role in shaping government direction by acting as military doctrine advocates and educators to government policy makers.

Government direction comes in two forms: defence policy and provision of resources. Nations like Canada do not have the fiscal resources to field a full range of military or aerospace power capabilities, so by stipulating what general military objectives are to be achieved, government defence policy gives the CF the marching orders it needs to get on with the job of enhancing the safety and security of Canadians, supporting the Government of Canada's (GoC's) foreign policy and achieving other national security objectives.<sup>1</sup> Defence policy also indicates into what military capabilities the Government is willing to invest in order to achieve its objectives. Hence, defence policy such as the *Canada First Defence Strategy* both defines and limits what the

CF actually does and what the RCAF is capable of doing.

*The Government's Canada First Defence Strategy (CFDS) defines the roles for the CF and identifies the military capabilities required to meet these roles.*<sup>2</sup>

Military direction comes from its commanders and doctrine. Command direction of a general nature is normally expressed in the form of strategic plans, business plans, and planning guidance, while experience-proven best practice methods of military force application are found in doctrine. CF Doctrine (joint), *Canadian Forces Aerospace Doctrine*, and the Chief of the Air Staff (CAS) Business Plan provide the following guidance on the role of military forces, the function of the RCAF, and the RCAF mission:

### The Role of Military Forces:

“Military forces in democracies are subordinate to the elected civil authority and are prohibited from operating outside the bounds of jurisdiction set by that authority. In addition to combat operations, they are often used for domestic missions such as search and rescue, assistance to other government departments and agencies, aid to civil power, and for disaster relief operations both at home and abroad. However, despite the inherent flexibility and domestic utility of modern military forces, their *raison d'être* remains armed conflict. This distinction separates military forces from other security arms of the government such as police and border patrol.”<sup>3</sup>

### Royal Canadian Air Force Functions:

“Air forces exist to exercise aerospace power on behalf of the nation. This is accomplished primarily through the exploitation of the air and space environments to achieve assigned objectives. A century of air warfare has demonstrated that all effective air forces, whether they

are large or small, are capable of performing a number of specific functions.”<sup>4</sup>

### Mission of the Royal Canadian Air Force:

“As an integrated element of the CF, the AF [RCAF] will provide the Government of Canada and Canadians with a relevant, *responsive and effective* aerospace instrument of national power.”<sup>5</sup>

Hence, it can be seen that within the context and control of the CF, the RCAF exists to exercise aerospace power on behalf of Canada. This aerospace power is an element of Canadian military power that is used for both combat and non-combat purposes, but its *raison d'être* remains armed conflict.” What the RCAF must, can and should do is driven by the competing demands between the functions the RCAF *must* fulfil, laid out in government defence policy (the CFDS), and the functions an air force *can* and *should* fulfil—the fundamental doctrinal aerospace power functions that have evolved out of “a century of air warfare” experience. While the CF must always remain responsive to changes in government defence policy, governments and military commanders should recognize the enduring aerospace power employment principles, characteristics, and fundamental functions that should reside in strategic aerospace doctrine to ensure that the RCAF is resourced, organized, equipped, and employed wisely and effectively. It is therefore critical that aerospace doctrine is clear and unambiguous.

### Doctrine and the Need for Clarity

Doctrine is a body of knowledge and thought that provides direction and aids understanding.<sup>6</sup> The primary function of strategic military doctrine is to provide knowledge and understanding of military power and to guide the use of armed forces.<sup>7</sup> In the Canadian context, Canadian military strategic doctrine is also used to “assist in shaping perceptions within the GoC and the CF about the use of military capabilities

as an instrument of national power,”<sup>8</sup> and this doctrine is “instrumental in establishing priorities for procurement [of these capabilities]....”<sup>9</sup> If the fundamental military functions these capabilities are meant to fulfil are not clearly understood, effective prioritization of or justification for their procurement can not easily occur.

*Not to have an adequate air force in the present state of the world is to compromise the foundations of national freedom and independence.*

— *Winston Churchill, House of Commons, 14 March 1933.*<sup>10</sup>

Canadian strategic aerospace doctrine must, as a primary national and military strategic communications tool, use simple and direct language to clearly describe the fundamental and enduring aerospace power functions the RCAF is meant to fulfil and what unique aerospace power capabilities the RCAF has or needs to fulfil these functions.



Does current aerospace doctrine do this? The latest edition of Canada’s strategic aerospace doctrine is well written, clear and concise regarding the fundamental

and enduring principles, characteristics, and tenets that describe and guide the proper application of aerospace power, and the historical and current national security contexts in which aerospace power has been and is employed. When it comes to describing what the RCAF does, however, Chapter 5 of *Aerospace Doctrine* entitled “The Functions of Canada’s Air Force [RCAF]” uses ambiguous military force development jargon,<sup>12</sup> which is anything but simple or clear (see Figure 2).



Figure 1. The Canadian F-35 Purchase Announcement<sup>11</sup>

Such is arguably the case regarding the planned procurement of 65 F-35 Lightning II joint strike fighter aircraft for Canada. The lack of general understanding of what this capability is for and what the RCAF exists to do may have contributed to public and government opposition party criticism of this acquisition project.

## RCAF Functions

(2010)

### **COMMAND**

#### **ACT**

- **SHAPE**
- **MOVE**

### **SENSE**

### **SHIELD**

### **SUSTAIN**

### **GENERATE**

Figure 2. The Functions of the Royal Canadian Air Force.<sup>13</sup>



*Canadian Forces Aerospace Doctrine* states that the functions of the Air Force are **Command, Act<sup>14</sup>, Sense, Shield, Sustain** and **Generate**. These terms promote some doctrinal and conceptual commonality at the military strategic level, but they are almost meaningless to the military doctrine layman. For example, using current terminology, the functional purpose of the CF18 or the follow-on F-35 capability is to fulfil the majority of the **Act (Shape)** Function of the RCAF. To someone inside the military not familiar with the latest doctrinal concepts and terms, or to anyone outside of the military, the **Act (Shape)** Function would be non-intuitive, and therefore, the function of the CF18/F-35 capability might seem vague, suspicious, and/or unnecessary.<sup>15</sup>

To be fair, *Canadian Forces Aerospace Doctrine* does indicate what sub-functions exist under the **Act** doctrinal jargon banner and it uses vastly more understandable language to describe them. Unfortunately, readers of this doctrine should not have to drill down into the detail to decipher and appreciate what the RCAF actually exists to do.

### The Origins of RCAF Functions: Concepts and Terminology

The following table describes the origins and evolution of the terms used to describe RCAF functions. It can be seen that most of the credit for the introduction of the terms currently used to describe the functions of the RCAF (and the CF Joint Capability Domains) clearly belongs to the Canadian Army (CA).

Army Operational Functions (1999) <sup>16</sup>	Canadian Joint Task List Capability Areas (2000) <sup>17</sup>	Aerospace Doctrine, AF Functions Ed. 1 (B-GA-400) (2007) <sup>18</sup>	Army Operational Functions and Core Functions* (2008) <sup>19</sup>	CF Doctrine - Joint Capability Domains (2009) <sup>20</sup>	Aerospace Doctrine, AF Functions Ed. 2 (B-GA-400) (2010) <sup>21</sup>
Command	Command**	Sense	Command	Command	Command
Act	Info & Intel	Shape	Act	Sense	Sense
Sense	Conduct Ops	Move	Sense	Act	Act – Shape & Move
Shield	Mobility	Sustain	Shield	Shield	Shield
Sustain	Protection	Command	Sustain	Sustain	Sustain
	Sustainment		* Find	Generate	Generate
	Force Generation		* Fix		
	Co-ord with Other Gov't Initiatives		* Strike		

\*\* The Army Op Functions and the original CJTL that both use the function/capability area "Command" were developed concurrently<sup>22</sup>

Terms first used by the Army
  Terms first used by CF/Joint
  Terms first used by Air Force

Table 1. Evolution of Functions and Capability Areas/Domains in Canadian Military Doctrine

In 1999, the CA moved away from its six combat functions (command, information operations, manoeuvre, firepower, protection and sustainment) because they were considered to be too focused at the tactical level and they did not easily address the moral domain (the elements of skill, courage and spirit that give a force life and the will to act). The operational functions of Command, Act, Sense, Shield and Sustain were considered broader in scope; they enabled more substantive analysis of future CA doctrine and force design, and they were applicable to the tactical, operational, and strategic levels.<sup>23</sup> By 2001, the CA was aware that the CF Central Staff had developed a CJTL (see Table 1) that included a framework for describing the various capability areas that were required by the CF. The CA thought their operational functions included the same joint capability areas within them; however, they had grouped these areas under different functional terms, which provided a more integrated approach, and although not an exact match, were similar enough that synchronization of effort was not anticipated to be a problem.<sup>24</sup>

By 2006/2007, the CA's broader, arguably more conceptual approach to the description of its operational functions may also have influenced the CAS. When presented with draft Air Force doctrine that contained functions that were more aligned with the North Atlantic Treaty Organization (NATO) and United States Air Force (USAF) air doctrine, the CAS directed that terms similar to those used by the CA be used and eventually signed off on Sense, Shape, Move, Sustain, and Command as the functions of the Air Force. Edition 1 of *Canadian Forces Aerospace Doctrine* uses these terms, but that document contained no explanation of their origin, and indeed, it implied that these functions were a product of "a century of air warfare" experience.<sup>25</sup>

In 2008, CA doctrine was introduced that contained its "Functional Framework," which consisted of a combination of its

five, circa 1999, operational functions, plus three core functions (Find, Fix, and Strike). These additional functions were described as the core or dynamic functions used in the application of combat power.<sup>26</sup> Shortly thereafter, in 2009, CF doctrine (joint) was promulgated, introducing the concept of joint capability domains that had evolved out of CJTL capability areas first produced in 2000, but which largely shared the same nomenclature as the CA operational functions.

Joint capability domains, although largely used as a capability categorization (administrative) tool, play a role in Canadian military conceptual capability-based planning (CBP) and joint force development thinking. CF doctrine states that the purpose of joint capability domains is to form a conceptual framework that can be used to categorize military capabilities. This framework supports a CBP process, which ensures that the CF has the correct mix of capabilities to support Canadian defence policy. These military capabilities do not focus on a particular environment or equipment but rather on those capabilities required to achieve military effects and ultimately strategic end states.<sup>27</sup> The capability framework consists of the 16 capabilities that were developed by joint capability planning teams (JCPTs) through scenario analysis, and the joint capability domains are simply a method to organize them relatively thematically.

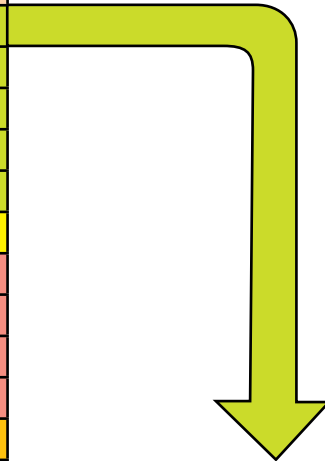
In December 2009, Edition 2 of *Canadian Forces Aerospace Doctrine* was published, indicating that the functions of the Air Force were aligned with CF doctrine. In fact, these RCAF functions are aligned with a joint capability categorization tool that is not, itself, purported to represent the strategic functions or roles of the Canadian military (CF doctrine describes the general role of military forces but does not identify specific functions of the CF).

Clearly the terms used to describe the functions of the RCAF have been

significantly influenced by the CA and the CF joint capability development community. In the end, the RCAF must decide if aligning its functions with these influences

is preferential over alignment with fundamental and enduring aerospace power functions and promoting clarity at the national strategic level regarding the purpose and

Domain	Capability
Command	Command Support
	Communications
	Joint Effects Targeting
Sense	Intelligence
	Surveillance & Reconnaissance
Act	Aerospace Effects Production
	Land Effects Production
	Maritime Effects Production
	Special Ops Effects Production
	Non-Kinetic Effects Production
Shield	Force Protection
Sustain	Sustainment
	Support Services
	Movements
	Theatre Activation & Deactivation
Generate	Force Generation



Capability	Functions	Activities	Example Activities
Aerospace Effects Production	Deny Aerospace to the Opposing Force (OPFOR)	Defend Friendly Aerospace	Conduct Air Intercept
		Defeat OPFOR Aerospace Assets	Conduct Defensive Counter Air
			Conduct Ground Based Air Defence
			Conduct Anti-Air Warfare
	Provide Freedom of Manoeuvre in the Aerospace	Combine Forces for Ops	Conduct Fighter Sweep
			Provide Aerospace Control
		Destroy or Suppress OPFOR Aerospace Assets on the Ground or at Sea	Conduct Combined Air Operations
			Conduct Suppression of Enemy Air Defence
			Conduct Covert Operations
			Conduct suppression of Surface-to-Air & Surface-to-Air Missile threats
		Protect Own Aerospace Assets	Conduct Offensive Counter Air
			Conduct Air Escort
Conduct Combat Air Patrol			
		Monitor Aerospace	

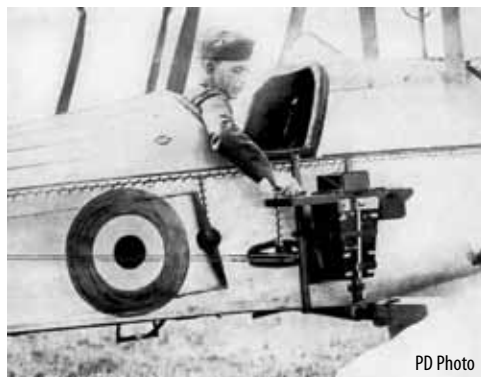
Table 2. The CF Capability Framework and Example Capability (Aerospace Effects Production).

functions of the RCAF. Command, Act, Sense, Shield, Sustain, and Generate do not clearly indicate what the RCAF does or should do. The RCAF already knows the reasons why air forces exist (the fundamental aerospace power functions), but it seems to be reluctant to admit them, publish them, and strategically communicate them. They can easily be found by examining the history of aerospace power; they are already buried deep inside in the current edition of *Canadian Forces Aerospace Doctrine* itself, and they are supported by aerospace power thinking and the doctrine of some of our closest allies.

### Fundamental Aerospace Power Functions

*A century of air warfare has demonstrated that all effective air forces, whether they are large or small, are capable of performing a number of specific functions.*<sup>31</sup>

**Aerospace Observation.**<sup>32</sup> The French Aerostatic Corps first used balloons for aerial observation at the Battle of Fleurus in 1794.<sup>33</sup> During the American Civil War, balloons were used for mapmaking, including the use of photography for that purpose, aerial observation of enemy encampments and movement, and for artillery fire direction. Italian fixed-wing, powered aircraft were used for similar observation purposes in 1911 during Italy's military action against Ottoman Empire forces in what is now known as Libya.<sup>34</sup> The use of aircraft for surveillance and reconnaissance over land and sea has remained commonplace in conflicts thereafter. Since the early 1960s, camera-equipped satellites have also seen military application as **aerospace observation** means.



PD Photo



Figure 3. AVRO BE2C camera carrying observation aircraft.<sup>35</sup>



Figure 4. A Canadian AF CP140 Aurora maritime patrol aircraft surveys the northern tip of Ellesmere Island, near the North Pole.<sup>36</sup>



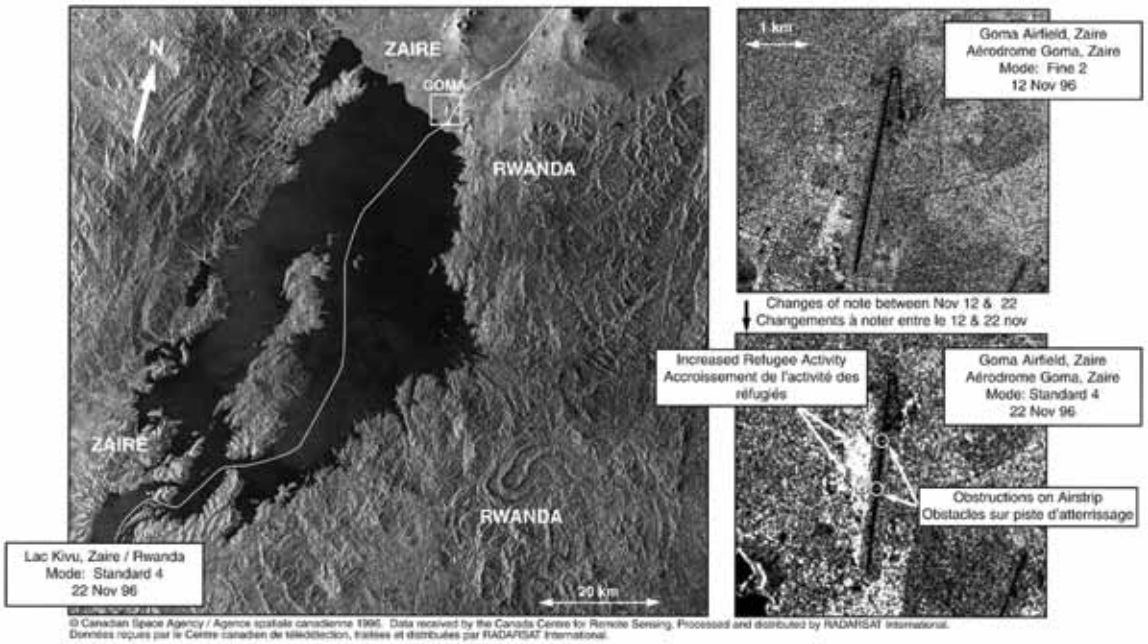


Figure 5. Canada’s RADARSAT-1 provides satellite images of a human crisis of major proportions affecting eastern Zaire in November 1996.<sup>37</sup>

**Air Strike.** The effort to directly attack military forces on the ground, national infrastructure, and/or ships at sea from the air began in Libya on November 1, 1911, when the Italians first conducted aerial bombardment of Ottoman enemy forces. Tactical and strategic attack operations from aircraft have been conducted ever since, including aerial bombing and strafing in support of land operations at the front lines, airship and fixed-wing bomber raids deep into enemy territory, and the use of land- and sea-based aircraft to strike surface and sub-surface naval vessels. In more recent times, aircraft have been used to conduct electronic warfare and information operations involving both kinetic and non-kinetic means. These “strikes” aim to directly affect the physical, cognitive, and moral domains of war.



Figure 6. Second World War (WWII) vintage Lancaster Bomber.<sup>38</sup>



Figure 7. A 425 Squadron (Sqn) CF188 Hornet configured with laser guided bombs during Operation (Op) MOBILE (Libya).<sup>39</sup>

**Air Mobility.** As soon as aircraft developed to the point that they could lift and carry more than their own basic load, air mobility became a cornerstone capability of air forces. The primary characteristics that air transport aircraft exploited, that set them apart from surface-based transportation systems, were speed, range, and obstacle avoidance (terrain and threat).<sup>40</sup> Aircraft that could conduct the **Air mobility** function enabled the rapid and far-reaching deployment, recovery, evacuation and/or resupply of military forces or endangered civilian personnel, as well as, in later years, the extension of the reach of other air capabilities through air-to-air refuelling (AAR). This fundamental aerospace power function has seen and continues to see universal employment throughout the full spectrum of conflict and in response to humanitarian crises and natural disasters.

*The 1948 Berlin Airlift was perhaps the West's greatest victory of the Cold War, a period in which airpower [sic] was repeatedly proved decisive. After the Soviets blockaded Berlin and forbade all land traffic, Allied airpower was able to keep West Berliners provisioned with food and fuel for 15 months. Airpower was shown to be a powerful tool of peaceful diplomacy. The entire world, but especially Germany, saw the West was attempting to save Berlin and its citizens, while the Soviets were trying to destroy them.*<sup>43</sup>



Figure 8. Canadian evacuees aboard a CC177 Globemaster aircraft at the Port-au-Prince International Airport in Haiti.<sup>41</sup>



Figure 10. Search and Rescue Technicians hoist from a CH149 Cormorant Helicopter to a fishing vessel.<sup>44</sup>



Figure 9. A CH147 Chinook leaves a Forward Operating Base (FOB) in Afghanistan.<sup>42</sup>



Figure 11. Two CF188 Hornets air refuel from a CC130T Hercules on a flight from Canada to Iceland to join Task Force Iceland at Keflavik Air Base, Iceland, in support of Op IGNITION.<sup>45</sup>

**Control of the Air.** The purpose of this core aerospace power function is to enable the use of an adversary's airspace for your own forces, while denying the adversary's use of the airspace above your own forces or territory. **Control of the air** does not

win wars on its own, but it may ensure that you do not lose them or suffer substantial casualties from enemy air attack.



Figure 12. Battle of Britain vintage Supermarine Spitfire flies with a Canadian CF188 Hornet.<sup>46</sup>



Figure 13. A CF188 Hornet intercepts, identifies and monitors a Russian Tu-95 Bear bomber as it passes through the North American Air Defence Identification Zone (ADIZ) in international airspace.<sup>47</sup>

*If we lose the war in the air, we lose the war, and we lose it very quickly.*

—Field Marshal Bernard Law Montgomery<sup>48</sup>



*Anyone who has to fight, even with the most modern weapons, against an enemy in complete command of the air, fights like a savage against modern European troops, under the same handicaps and with the same chances of success.*

—Field Marshal Erwin Rommel, *Rommel Papers, 1953*<sup>49</sup>



**Control of the air** offers both defensive and offensive benefits. It limits or prevents entry into your own territory or military operating area by air, thus protecting civilian

and military personnel and infrastructure from adversary influence or aerial attack. By establishing some degree of control of the air over the adversary's territory or military forces, aerospace power can also open the door for the other key air activities like air mobility, aerospace observation, and, most importantly, it can permit offensive action like an air strike which can destroy the adversary's ability or will to fight. For the profound effect it can have on many types of warfare, **control of the air** is often considered the primary aerospace power function.



Figure 14. Air controllers participating in Exercise MAPLE FLAG XL (MF40) mission at 42 Radar Squadron.<sup>50</sup>

## Fundamental Aerospace Power Functions versus Royal Canadian Air Force Functions

**Aerospace observation, air mobility, air strike, and control of the air** represent functions that provide unique aerospace power services to the nation and its military forces. Although many other functions have been and are fulfilled by air forces, these four are both fundamental and enduring,

representing what an air force exists to do. Supporting this appreciation of the fundamental aerospace power functions are the *Canadian Forces Aerospace Doctrine* itself,



and the strategic aerospace doctrine of some of our closest allies; namely, the United Kingdom<sup>51</sup> and Australia.<sup>52</sup> In Canada's case, *Canadian Forces Aerospace Doctrine* states:

“The activities of Act and Sense are arguably the reasons that air forces exist. Their conceptual development mirrors that of the evolution of aerospace power itself. Aircraft were specifically developed to Sense, Shape, and then Move. This evolution was based on advances in both technology and a willingness to exploit it. Nations ultimately create air forces to achieve one or a combination of Sense, Shape, or Move.”<sup>53</sup>

*Canadian Forces Aerospace Doctrine* recognizes the reasons that air forces exist (in a footnote, using the generic terms **Sense**,

**Shape** and **Move**), and this enables the division of RCAF functions into two categories: the reasons why air forces exist; and the other air force functions. If we compare these current doctrinal air force functions with the shared fundamental and enduring aerospace power functions, they align as follows:

**Command, Shield, Sustain and Generate** are enabling functions common to all three environments; they are necessary for the provision of military power, but they are not the primary reasons why Canada has military or aerospace power. Interestingly, the CF force development analytic framework and CBP process also consider **Sense** to be a joint capability domain that contains only enabling capabilities. From the RCAF perspective though, the enduring aerospace observation function and

Functions of Canada's AF <sup>54</sup>	Fundamental Aerospace Power Functions
<i>Reasons Why Air Forces Exist...</i>	
SENSE	
Provide the Commander with Knowledge	Note 1.
Collect Data - sensors	AEROSPACE OBSERVATION
Process Data - personnel and IT	Notes 1 and 2.
ACT – SHAPE	
Control of the Air	CONTROL OF THE AIR
Strategic Effect Spt to Land and Naval Forces	AIR STRIKE
Information Operations	Notes 1 and 3.
ACT – MOVE	
Air Mobility (Airlift & AAR) Personnel Recovery	AIR MOBILITY
<i>Other Air Force Functions...</i>	
COMMAND SHIELD SUSTAIN GENERATE	Enabling Functions (notes 1 and 4)

Note 1 – not an air force unique function.

Note 2 – in the air force context, the combination of data collection and processing functions is often termed the Intelligence, Surveillance and Reconnaissance (ISR) enterprise.

Note 3 – aerospace power can contribute to influence operations.

Note 4 – critical services required to raise, equip, sustain, and employ an air force, but not unique aerospace power functions provided to the nation (the reasons air forces exist).

Table 3. The Functions of the RCAF versus Enduring Aerospace Power Functions



the related surveillance and reconnaissance roles in particular are fundamental, directly achieving both national and military information collection objectives, and largely inseparable from the battlespace awareness and targeting processes so relevant to the **control of the air** and **air strike** functions.

*The capabilities in the Command, Sense, Shield, Sustain and Force Generation domains are considered “enabling” capabilities, while the capabilities in the Act domain are considered “act” capabilities. Enabling capabilities provide support to act capabilities that produce direct effects within operations.<sup>55</sup>*

### Unity of Purpose (Ends) not Commonality of Warfighting Methods (Ways)

No single environment has all of the capability required to fulfil national strategic objectives involving the military instrument of national power. Military strategy to achieve these objectives (ends) represents the unified goals of military action, but not unified ways in which to achieve them. The manner in which these goals (military strategic objectives) are achieved involve the complementary combination of air, land, and maritime force warfare methods (ways) and effects, and a mixture of joint and relatively independent single-environment action. Unity of purpose and synergistic effects at the strategic level do not mean one service is the supported service and the other services are just there to help the first one achieve the strategic objectives.

Air, land, and sea power are different beasts, each having different characteristics, strengths and weaknesses driven for the most part by the air, land, and sea contexts in which their associated forces predominantly operate. Hence, air, land, and maritime component employment strategies (ways) and the capabilities required to execute those strategies (means) that maximize a particular force’s strengths, while minimizing their weakness, have evolved differently over time.

For example, the seizing and holding of ground has always been the strength of land forces. When a land force attempts to seize territory, it is most often met by an opposing land force trying to defend it. It is not surprising that Clausewitzian land warfare theory involves looking at war as a series of battles between military forces,<sup>56</sup> with the defeat of one’s adversary military forces as the key military strategic objective. There is no doubt that land warfare theory has evolved from the time of Clausewitz, and now includes other concepts like manoeuvre warfare theory, but “to close with and destroy enemy military forces” has remained a fundamental function of land forces. In the CA, the core functions of **Find, Fix and Strike** are examples of this fundamental land warfare methodology.

Conversely, almost from the time of its inception, air warfare theory has stressed taking the fight to the enemy’s heartland and directly attacking its strategic centres of gravity. The strategic bombing campaigns of WWII evolved out of air warfare theory such as this, developed by the likes of Douhet.<sup>57</sup> Later, Warden’s five-ring theory, central to Op INSTANT THUNDER (the air campaign portion of Op DESERT STORM), saw fielded enemy forces as the lowest strategic priority for targeting, while attacking the enemy’s brain and central nervous system to invoke strategic paralysis—its command and control, organic essentials and infrastructure—was the key strategy to win the war.

If air, land, and maritime forces operate predominantly in different contexts, have significantly different characteristics, strengths and weaknesses, apply fundamentally different methods of warfare, and use significantly different capabilities to achieve their objectives, does it seem logical that their fundamental functions would be named the same? Unity of purpose for military forces trying to create joint effects is critical, but commonality of doctrinal

wording that inhibits a general understanding of why a force exists or what fundamental functions it brings to the joint fight is detrimental to true understanding of the largely interdependent but different roles military environments play in joint warfare.

### The Way Ahead.

As previously discussed, strategic military doctrine provides knowledge and understanding of military power, guides the use of armed forces, shapes perceptions within the GoC and the CF about the use of military capabilities as an instrument of national power, and influences the CF force development and CBP processes that help drive the procurement of future military capabilities. Current strategic CF aerospace doctrine uses military CBP-friendly terms—spawned from CA operational function terms—to describe the functions of the RCAF that are useful in satisfying one of the above intents of strategic doctrine. It does not, however, clearly or adequately describe the fundamental aerospace power functions in a way that promotes knowledge and understanding of aerospace power, how it should be used, or what military instruments of national power are provided by the RCAF.

A potential solution to this lack of clarity is to include fundamental aerospace power functions in the next edition of *Canadian Forces Aerospace Doctrine*, rename the current “**Functions of Canada’s Air Force**” as “**Capability Domains of the Royal Canadian Air Force**” and show how they align to each other, as well as how they both relate to the other sub-functions, roles, missions or tasks that the RCAF performs. In the interim, an information brochure could be produced, supported by education media like briefing packages and videos that contain this new approach highlighting the fundamental aerospace power functions while recognizing the importance of RCAF capability domains. This supplement to Edition 2 of *Canadian Forces Aerospace Doctrine* should be provided to senior

RCAF commanders and RCAF education institutions. In this manner, the RCAF’s primary, strategically focused, foundation document and supplement would speak in a simpler and more direct way to a broader audience. This audience should include those important stakeholders outside the military who might wonder what functions an expensive aerospace power capability like a multi-role fighter or remotely piloted aircraft fulfils, how these functions link to the RCAF part of the CF mission, and hence, what contribution they make to the overall security of Canada, Canadians and their national interests.

Without throwing the baby out with the bathwater, Table 4 illustrates how aerospace power functions could be expressed in terms of fundamental functions, while retaining the linkage to joint CBP processes and the operational functions of the other environments. While the exact wording of aerospace power functions, sub-functions/roles, and missions shown is not carved in stone, the concept of linking fundamental functions to air force capability domains, instead of replacing fundamental functions with joint capability domains should be embraced.

### Conclusion

It is critical that the RCAF strategically and clearly communicates what fundamental services the RCAF provides to the nation, so the nation understands why it is necessary to raise, train, and equip their air force and what is needed to effectively sustain and employ that force. As many CF operations are joint/integrated operations, this information also needs to be clearly understood by the other military environments and government departments involved.

Air force strategic doctrine is the primary medium to define and communicate these core aerospace power functions and capability domains to the RCAF, CA, Royal Canadian Navy (RCN), public, and government. In an effort to align with joint

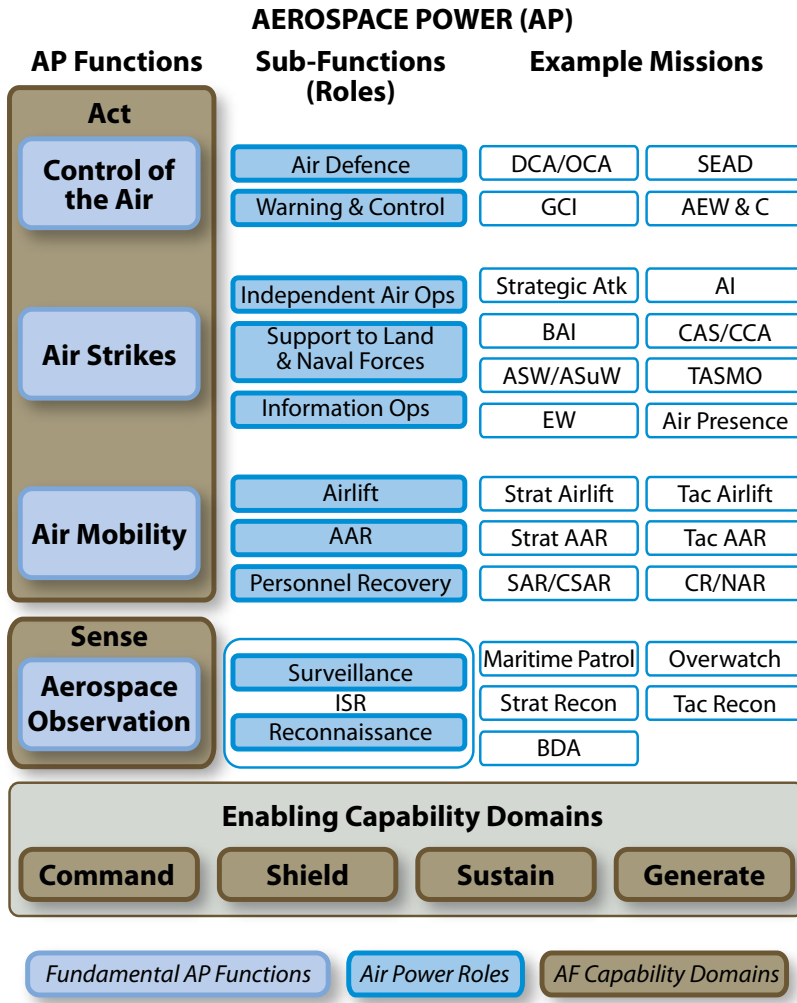


Table 4. Fundamental Aerospace Power Functions and Air Force Capability Domains

doctrinal nomenclature, the RCAF has sacrificed clarity in favour of military force development jargon commonality. This lack of clarity has negatively impacted the ability of the RCAF to justify what it does and what unique capabilities it needs to do its job.

While acknowledging that raising, protecting, sustaining, and commanding air forces are absolute necessities, they are not, in themselves, the reasons why Canada has an air force. When the Canadian citizenry or government finds it difficult to understand, or its air force finds it difficult to explain or justify in simple terms, why

it needs core aerospace power capabilities, perhaps it is time to take a hard look at how the basic functions of the RCAF are expressed. Air forces exist to provide four fundamental services to the nation: control of the air, movement of things through the air, observation of things from the air and space, and when necessary, attacking things from the air. Strategic aerospace doctrine should reflect that. ■

*The beginning of wisdom is to call things by their right names.*

— Chinese proverb

Lieutenant-Colonel Brian L. Murray, CD, is the Canadian Forces Liaison Officer to the Royal Australian Air Force Air Power Development Centre. Lieutenant-Colonel Brian “Mur” Murray has completed operational tours on the CH136 Kiowa and CF18 Hornet, accumulating over 4000 hours of helicopter and fighter flying time since joining the Canadian Forces in 1985. His career highlights include deploying to Italy in 1999 for Op ALLIED FORCE, and acting as officer in charge of the Fighter Weapons Instructor Course in 2000 and 2001, deputy commanding officer of 410 Tactical Fighter (Op Training) Sqn in 2002 and 4 Wing Cold Lake Standards Officer in 2003. In 2009, after completing a tour as the Analysis and Lessons Learned Branch Head in the Canadian Forces Aerospace Warfare Centre, Lieutenant-Colonel Murray became the Canadian Forces Liaison Officer to the Royal Australian Air Force Air Power Development Centre in Canberra, Australia.

## Abbreviations

AAR	air-to-air refuelling
AEW&C	airborne early warning and control system
AF	air force
AI	air interception
ASuW	antisurface warfare
ASW	antisubmarine warfare
atk	attack
BAI	battlefield air interdiction
BDA	battle damage assessment
CA	Canadian Army
CAS	Chief of the Air Staff
CAS	close air support
CBP	capability-based planning
CCA	close combat attack
CF	Canadian Forces
CJTL	Canadian Joint Task List
CR	combat recovery
CSAR	combat search and rescue
DCA	defensive counter-air
EW	electronic warfare
GCI	ground controlled interception
GoC	Government of Canada
ISR	intelligence, surveillance and reconnaissance
NAR	non-conventional assisted recovery
OCA	offensive counter-air
Op	operation
RCAF	Royal Canadian Air Force
RECON	reconnaissance
SAR	search and rescue
SEAD	suppression of enemy air defences
sqn	squadron
strat	strategic
tac	tactical
TASMO	tactical support for maritime operations
USAF	United States Air Force

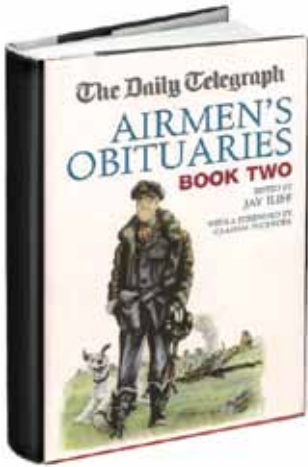
## Notes

1. Canada, Department of National Defence (DND), *Canada First Defence Strategy*, 3.
2. B-GJ-005-000/FP-001 Canadian Forces Joint Publication, *CFJP 01 Canadian Military Doctrine*, 2009-04, 2–7, [http://dsp-psd.pwgsc.gc.ca/collection\\_2010/forces/D2-252-2009-eng.pdf](http://dsp-psd.pwgsc.gc.ca/collection_2010/forces/D2-252-2009-eng.pdf) (accessed September 7, 2011).
3. *Ibid.*, 2–2.
4. B-GA-400-000/FP-000 *Canadian Forces Aerospace Doctrine*, ed. 2, December 2010, 35.
5. CAS, *Air Force Business Plan FY 10/11*, 30 July 10, Part 1, 2/3.
6. B-GJ-005, 1–1.
7. *Ibid.*, 1–4.
8. *Ibid.*, 1–4.
9. B-GA-400, ed. 2, 1.
10. “Great Aviation Quotes,” <http://www.skygod.com/quotes/airpower.html> (accessed September 7, 2011).
11. The CAS, Lieutenant-General André Deschamps states during a GoC announcement that the CFs will receive 65 fifth generation Joint Strike Fighter F-35 aircraft, beginning in 2016, as a replacement to its current fleet of CF-18s, photo credit: Corporal Darcy Lefebvre © 2010 DND-MDN Canada, FA2010-0218-18 (accessed September 7, 2011).
12. “Jargon – the specialized language of groups of people has its place in the workplace. It can provide useful shorthand to get across specific meaning quickly. But jargon becomes a problem when it stops people understanding your message. When you start using jargon (perhaps unintentionally) with audiences it is not intended for, people will find you very difficult to understand. Even within the group the jargon’s meant for, meanings evolve and newcomers misunderstand. And soon jargon can create barriers within groups too. Whatever the reason you use jargon, if it’s out of place and the audience misunderstands, it can create a two-fold problem. Whilst you fail to convey information to them, you may also succeed in conveying a more subtle, negative message: That you have given little thought to your audience; and perhaps that you are insincere and not to be trusted. Worse, you may never know that your audience has not understood – people often don’t say anything if they mistrust you, or if they fear of looking unintelligent themselves.” “Jargon Busting – Communicating Without Barriers,” <http://www.mindtools.com/CommSkill/JargonBusting.htm> (accessed September 7, 2011).
13. B-GA-400, ed. 2, 35.
14. The Act function is supported by two sub-functions: Shape and Move.
15. See Note #12 above.
16. Canada, DND, *The Future Security Environment: Report 99-02*, Kingston, ON: Directorate—Land Strategic Concepts (DLSC), August 99, 40.
17. Canada, DND, *Strategic Capability Planning for the Canadian Forces*, 13 June 2000, 23, [http://www.navy.dnd.ca/leadmark/doc/part2\\_e.asp](http://www.navy.dnd.ca/leadmark/doc/part2_e.asp) (accessed September 7, 2011).
18. B-GA-400, ed. 2, 37.
19. B-GL-300-001/FP-001 *Land Operations*, 2008-01-01, 4–18, <http://info.publicintelligence.net/CanadaLandOps.pdf> (accessed September 7, 2011).
20. B-GJ-005, 2–7.
21. B-GA-400, ed. 2, 35.
22. Canada, DND, *Future Army Capabilities*. Kingston, ON: DLSC Report 01/01, January 2001, 9.
23. *Ibid.*
24. *Ibid.*; also, see footnote #32.
25. B-GA-400, ed. 1, 2007, 37.
26. B-GL-300, 4-19 and 4-21.
27. *Ibid.*, 2-7.
28. Canada, DND, *Strategic Capability Roadmap Version 1.0 Analytic Framework*, DRDC CORA TR 2009-013, Defence Research and Development Canada (DRDC), Operational Research Division, December 2009, 8.
29. *Ibid.*, 9.
30. B-GA-400, ed. 2, 35.



31. Ibid.
32. "Aerospace observation" is a term selected by the author. This fundamental aerospace power function is also known as air observation, (air or space) surveillance, (air or space) reconnaissance, ISR, and ISTAR. Noting that the Royal Australian Air Force (RAAF) use the term "ISR" and the Royal Air Force (RAF) use the term "Intelligence and Situational Awareness" to represent this aerospace power function, it can be argued that the true aerospace uniqueness of this function is derived from the aerospace perspective of the "observing" capability.
33. History of military ballooning, Wikipedia, [http://en.wikipedia.org/wiki/History\\_of\\_military\\_ballooning](http://en.wikipedia.org/wiki/History_of_military_ballooning) (accessed September 7, 2011).
34. RAAF Air Power Development Centre, *Pathfinder #152 – The Experience of Air Power in Libya*, March 2011, <http://airpower.airforce.gov.au/Publications/List/41/Pathfinder.aspx>, (accessed September 7, 2011).
35. CF Photo, <http://www.airforce.forces.gc.ca/v2/equip/hst/be2c-eng.asp> (accessed September 2, 2011).
36. Photo by Corporal (Cpl) Evan Kuelz, RE2007-056-028, 11 Aug 2007, Iqaluit, Nunavut, Canada, <http://www.airforce.forces.gc.ca/v2/netpub/index-eng.asp?rid=6798-RE2007-056-028> (accessed September 7, 2011).
37. Photo credit – Canadian Space Agency, <http://www.asc-csa.gc.ca/images/recherche/photo.aspx?id=225&format=0&search=satellite&page=1> (accessed September 7, 2011).
38. Photo by Private (Pte) Pierre Cloutier, CK2009-0406-01, August 1, 2009, Cold Lake, Alberta, <http://www.airforce.forces.gc.ca/v2/netpub/index-eng.asp?rid=9044-CK2009-0406-01> (accessed September 7, 2011).
39. Photo by Cpl Marc-André Gaudreault, Canadian Forces Combat Camera © 2011 DND-MDN Canada, IS2011-6002-133, 3 April 2011, Trapani, Italy, <http://www.airforce.forces.gc.ca/v2/netpub/index-eng.asp?rid=10188-IS2011-6002-133> (accessed September 7, 2011).
40. Aircraft, uniquely, can use altitude to vertically avoid and overfly many unsophisticated surface or sub-surface-based threats (mines, IEDs, small arms fire, submarines).
41. Photo by Master Cpl David Hardwick, DA2010-0001-35, Jan 17, 2010, Canadian Embassy, Port-Au-Prince, Haiti, <http://www.airforce.forces.gc.ca/v2/netpub/index-eng.asp?rid=9382-DA2010-0001-35> (accessed September 7, 2011).
42. Photo by Cpl Keith Wazny, Joint Task Force Kandahar, Afghanistan, Roto 9, © 2010 DND-MDN Canada, AR2010-0181-73, 16 July 2010, Kandahar, Afghanistan, <http://www.airforce.forces.gc.ca/v2/netpub/index-eng.asp?rid=9513-AR2010-0181-73> (accessed September 7, 2011).
43. Phillip S. Meilinger, "A Short History of 'Decisiveness,'" *airforce-magazine.com* 93 no. 9, September 2010, <http://www.airforce-magazine.com/MagazineArchive/Pages/2010/September%202010/0910history.aspx> (accessed September 7, 2011).
44. Photo by Cpl Jax Kennedy, Canadian Forces Combat Camera © 2011 DND-MDN Canada, IS2011-5013-13, 24 March 2011, St John's, Newfoundland and Labrador, <http://www.airforce.forces.gc.ca/v2/netpub/index-eng.asp?rid=10159-IS2011-5013-13> (accessed September 7, 2011).
45. Photo by Capt Iain Hannam, 409 Sqn Cold Lake © 2011 DND-MDN Canada, CK2011-0110-29, 4 Apr 2011, Keflavik, Iceland, <http://www.airforce.forces.gc.ca/v2/netpub/index-eng.asp?rid=10161-CK2011-0110-29> (accessed September 7, 2011).
46. Photo by Kevin W. Moore, ISX2008-0039, August 27, 2008, <http://www.airforce.forces.gc.ca/v2/netpub/index-eng.asp?rid=8047-ISX2008-0039> (accessed September 7, 2011).
47. DND Photo - OD2007-09-05a, 5 Sep 2007, <http://www.airforce.forces.gc.ca/v2/netpub/index-eng.asp?rid=6687-OD2007-09-05a> (accessed September 7, 2011).
48. United Kingdom, Air Staff – Ministry of Defence, *British Air and Space Power Doctrine, AP 3000 Fourth Edition*, 37, [http://www.raf.mod.uk/rafcms/mediafiles/9E435312\\_5056\\_A318\\_A88F14CF6F4FC6CE.pdf](http://www.raf.mod.uk/rafcms/mediafiles/9E435312_5056_A318_A88F14CF6F4FC6CE.pdf) (accessed September 7, 2011).
49. Great Aviation Quotes.
50. Photo by Cpl Igor Loutsiouk, FA2007-2043a, 01 June 2007, Cold Lake, Alberta, <http://www.airforce.forces.gc.ca/v2/netpub/index-eng.asp?rid=6575-FA2007-2043a> (accessed September 7, 2011).
51. Referred to as "control of the air and space, air mobility, intelligence and situational awareness (which includes surveillance and reconnaissance), and attack" in *British Air and Space Power Doctrine, AP 3000 Fourth Edition*, 37.
52. Speech delivered by RAAF Chief of Air Force during the 2010 RAAF Air Power Conference, 29 Mar 10, and recent air power doctrine work done by the RAAF Air Power Development Centre reflects the four core functions of Control of the Air, Strike, ISR and Air Mobility.
53. B-GA-400 ed. 2, 36, footnote 3.
54. Ibid., 35.
55. Canada, DND, *Strategic Capability Roadmap Version 1.0 Analytic Framework*, DRDC CORA TR 2009-013, DRDC, Operational Research Division, December 2009, 8.
56. Phillip S. Meilinger, "The Mutable Nature of War," *Air & Space Power Journal* XXIV, Winter 2010, no. 4, 27.
57. "Giulio Douhet was the first airpower [sic] theorist. Born in Italy in 1869 and commissioned as an officer in the Italian artillery in 1882, he began thinking about airplanes in 1909 and had formed the core of his airpower thought by the middle of World War I. His landmark treatise on airpower, *The Command of the Air*, was first published in 1921. . . . He believed that the airplane's inherent speed and ability to reach any point within an enemy country meant that an attacking air force could bypass enemy fielded forces and provide a shortcut to victory." Raymond P O'Mara, *Clearing the Air: Airpower Theory and Contemporary Airpower*, *Air Force Journal of Logistics* 34, issue 1, 55.

# BOOK REVIEWS



The Daily Telegraph

## AIRMEN'S OBITUARIES BOOK TWO

EDITED BY JAY ILIFF

London:  
Grubb Street, 2007  
416 pages (hardcover) ISBN 978-1904943-839

Review by  
**Colonel Peter J. Williams, CD**

While on exchange duty in the United Kingdom some years ago, I was an avid reader of their newspapers and came to very much appreciate the somewhat unique art of the military obituary. They were consistently well written and often entertaining, the British penchant for double-barreled names making them all the more pleasurable. Here in Canada, *The National Post* is perhaps the best source for such works. All this to say that I was highly pleased to learn that Britain's *Daily Telegraph* has produced several volumes of these.

The work under review is *Book Two* (*Book One* includes obituaries of such notable airmen as the German Colonel Erich Hartmann [credited with 352 kills], the Royal Air Force's Squadron Leader "Ginger" Lacey and the American General Ira Eaker, who led the US 8<sup>th</sup> Air Force in the Second World War [WWII]). Similarly, there are also books on army and naval obituaries.

*Book Two* is organized into the following sections:

- First World War Veterans;
- Fighter Boys
- Bomber Boys
- Daredevils

- Special Operations Executive (SOE), whose pilots flew Allies' agents into German-occupied Europe
- Foreign Friends
- The Girls
- Civilians
- Test Pilots
- Maritime
- Escapers and Evaders
- Industrialists and Engineers
- George Cross Winners
- Distinguished Leaders

Most of the obituaries in the book were written by Air Commodore Graham Pitchfork and Ted Bishop, the latter having compiled *Book One* and who passed away in 2003. In preparing each entry, these men were assisted by the Air Historical Branch of the Royal Air Force (RAF). Given the rapidity with which the obituaries were published after the subject's death (normally the next day) and the details contained, one would hazard a guess that many of them were prepared well in advance.

Each entry runs three to four pages and some of them make this a book to which

one wants to return from time to time. The format of each follows the time-honoured tradition of opening with a brief mention of the events for which the deceased is best known, which are then described in further detail. The departed airman's birth, early life, and career are then discussed, and the entry ends with details of marriage, if indeed such a union ever took place. The entry for General Stanislaw Skalski (Poland's top-scoring WWII ace with at least 22 kills) ends simply stating, "Stanislaw Skalski was unmarried."<sup>1</sup> Comparatively, the entry for Major General Charles Sweeney, who piloted the B-29 that dropped the atomic bomb on Nagasaki, notes that he "...had three sons and seven daughters by his marriage, which was dissolved."<sup>2</sup>

Though the book has a definite British flavour and bias, several distinguished Canadians are included, such as Wing Commander "Moose" Fumerton, our most successful WWII night-fighter pilot; Lieutenant-General Reg Lane, who commanded Canada's only Pathfinder Squadron over occupied Europe in WWII, and finally, Air Commodore Len Birchall, the "Saviour of Ceylon," who passed away on 11 September 2004, aged 89.

It is somewhat difficult from a summary of only a few pages to get the true measure of these men and women, but I found that whether due to the deceased's actual accomplishments or the skill of the writers, each comes across as larger than life. For example, Captain Ian Harvey, a pilot with British European Airways, was awarded the George Medal for saving the lives of his passengers when a bomb exploded aboard his civilian airliner while in flight. I was also not disappointed with the entry for Group Captain the 9<sup>th</sup> Earl of Ilchester (or as his parents named him, Maurice Vivian de Trouffreville Fox-Strangways!). While serving as an RAF apprentice at Brize Norton during WWII, he was caught taking a bath during an air raid. He quickly ran, naked, to the nearest air-raid shelter, which he

found had been set aside for the Women's Auxiliary Air Force. His entry records, "As he appeared at the entrance, a tall, attractive girl shouted, 'he's mine' – a year later she became his wife."<sup>3</sup>

Currently, members of our own air force are doing sterling work both at home and abroad, whether undertaking hazardous search and rescue missions across Canada or flying the skies above Libya, so when it comes time for these folks to pass, one would hope that their lives will receive similar accolades to those whose deeds are chronicled in this excellent book.

This book is very highly recommended, particularly for courses in which air force history is taught, for those tasked with speeches at our Depart with Dignity ceremonies, or as inspiration for some words in memory of a departed comrade. ■

---

Colonel Peter J. Williams, an artillery officer, is Director Current Operations on the Strategic Joint Staff.

---

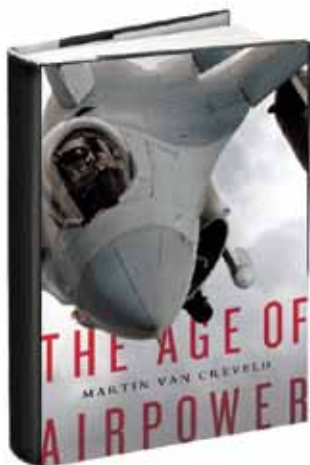
#### Abbreviations

RAF	Royal Air Force
WWII	World War II

---

#### Notes

1. Jay Illiff, ed., *The Daily Telegraph Airmen's Obituaries Book Two* (London: Grubb Street, 2007), 221.
2. *Ibid.*, 217.
3. *Ibid.*, 367.



## THE AGE OF AIRPOWER

BY MARTIN VAN CREVELD

United States of America:  
PublicAffairs Books, 2011  
498 pages ISBN 978-1-58648-981-6

Review by  
**Major Chris Buckham, CD, BA, MA**

Martin van Creveld has a long history of scholarly writings that explore and challenge long-held beliefs and the “sacred elephants” of the military. His latest book, *The Age of Airpower*, is no exception. Continuing his tradition of exceptionally detailed research and extrapolation/interpretation of data, he traces the evolution of air power as an effective and relevant “third pillar” in the commander’s arsenal. Commencing with the development of flight pre-First World War (WWI), he tracks its spectacular rise from rather obscure and simplistic beginnings, through its expansion and technological development at all doctrinal levels (strategic, operational, and tactical) during the ensuing Second World War (WWII) and cold war years, culminating in its role in what has become the modern asymmetric battlefield of the post-Soviet era.

Of particular note is van Creveld’s look at the impact of the nuclear and missile age upon air power as a stand-alone capability. Once considered to be the mainstay of the world’s air forces, the bomber arm ran into technological and doctrinal trouble with the advent of ballistic missiles, intercontinental ballistic missiles (ICBMs), cruise missile capability, and nuclear warfare. Following

WWII, air forces worked very hard to maintain a role for themselves as the only arm capable of carrying out a nuclear strategic strike against an enemy force. However, with the advent of smaller nuclear warheads and an increase in missile range and accuracy, expensive bombers became redundant and gradually disappeared from the line of battle as a separate capability. In fact, ironically, increased accuracy of missiles has resulted in a diminishment of the strategic aspect of air operations. That is to say, all targets, regardless of range, may now be considered tactical in nature, which constitutes a dramatic change in paradigm.

The canvas of this book is very broad, encompassing comments upon the diminishment of the naval air arm in the post-WWII era, areas of cold war conflict such as the Middle East, the failure of air power to be able to effectively come to grips with insurgents in non-traditional combat environments, and the challenge of creating doctrine that establishes effective parameters of use for air forces. One of the strengths of this book is that van Creveld makes use of historical examples to reinforce and clarify his observations. This makes it much easier to follow and to understand the applications he discusses.



His work outlines several key elements of the air power story:

- **Rapid development.** Its rise and capability development has been unprecedented in military history. It may be argued that no other element of military force has benefitted from the advent of both the industrial/technological revolution and the requirements of war.
- **New view of warfighting.** The development of air power and its doctrine has had a fundamental impact on the evolution in doctrine of the other branches of the military and the paradigm through which commanders and governments envision and prepare for conflict.
- **Capability outpacing doctrine.** The vision of the role, use and effectiveness of airpower has been challenging and controversial because capabilities have evolved at a breath-taking rate, precluding the opportunity to draw upon historical precedents to evaluate future focus.
- **Research and development (R&D) prohibitively expensive.** Air power is rapidly becoming a potential victim of its own success in that cost required for R&D is outpacing the national level capacity to fund. This results in fewer states being able to create and maintain cutting-edge capability. This in turn results in diminishing markets for sale, higher per unit cost, and a subsequent reluctance of national governments to assume risk in the utilization of these assets.
- **Air assets and asymmetric warfare.** The rise of asymmetric-style warfare with its emphasis on non-traditional-style combat and lack of “hard targets” revealed a series of limitations in the

effective utilization of air assets as an efficient counter to these threats.

- **New technology.** The traditional sense that air forces, due to what we may call their “individuality and youth,” have always challenged the more traditional aspects of military force, and now find the challenges coming full circle as they grapple with the concept that technology may be undermining the requirement for manned aircraft and what the role will be for the aircrew of the future.

Overall, this book represents to the air force professional and the general reader a concise synopsis of issues that face not only air forces, but also governments as they balance defence needs with budgetary constraints. There are some very uncomfortable questions raised by van Creveld that challenge the very foundations upon which air forces are built and developed; questions that need to be asked and debated openly and frankly as we move into the future. ■

---

Major Chris Buckham, an air logistics officer, is presently an integrated lines of communication (ILOC) officer with United States European Command (EUCOM) in Stuttgart, Germany. He has served with all elements including Special Operations Forces Command (SOFCOM) and has a master's degree in International Relations from Royal Military College.

---

#### Abbreviations

R&D	research and development
WWI	First World War
WWII	Second World War

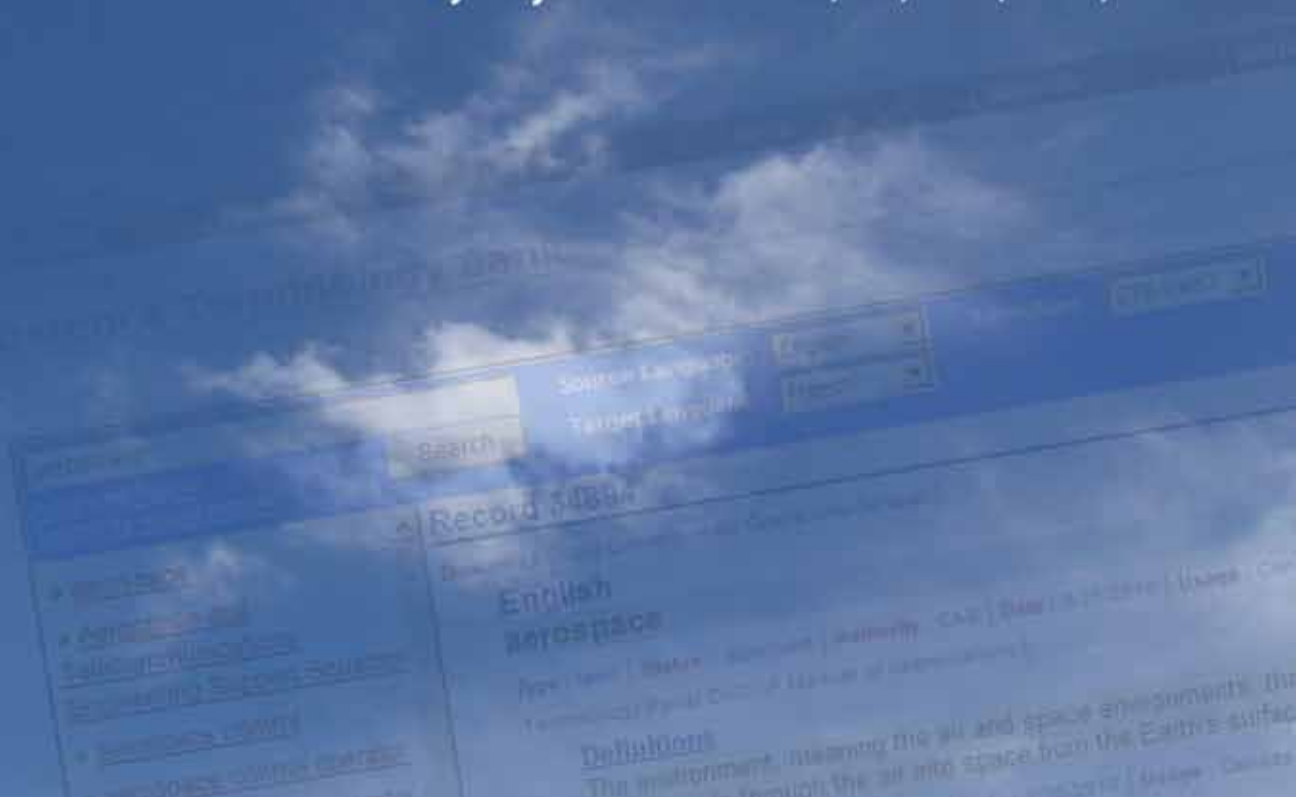
points of interest

# Terminology Talk

(Article 2)

## “Deployed” versus “Expeditionary”

By Major James Bound, CD, BSc (Hons)



## "Deployed" versus "Expeditionary"

### Background

Oxford English Dictionary (<http://www.oed.com/>)

**deploy**, v.

2. *Mil.*

a. *trans.* To spread out (troops) so as to form a more extended line of small depth.

b. *intr.* Of a body of troops: To open out so as to form a more extended front or line. Also *fig.*

**expeditionary**, adj. and n.

A. *adj.* Of or pertaining to an expedition; sent on an expedition.

B. *n.* An officer who took care of dispatches at the Pope's court. (*obsolete*)

**expedition**, n.

2. b. A journey, voyage, or excursion made for some definite purpose.

### Introduction

The Air Force uses both *deployed* and *expeditionary* in official documentation. Their usage varies between being synonymous or different, depending on the context. Using the online Oxford English Dictionary (OED) as a reference, the terms appear to be different in concept: *deployed* is used in a tactical rather than in an operational context, and does not connote travel to distant parts; *expeditionary* does indeed have an operational context, and is consistent with

normal military usage. So from an OED perspective, they are different. Are they different from a military perspective? Let us take a closer look.

### Discussion

Although the following terms from the Defence Terminology Bank (DTB) could be deemed to be comparing apples and oranges, the usage of *deployed* and *expeditionary* is consistent in their intended context.

Record 30809 <b>deployed operating base</b>	Fiche 30809 <b>base d'opérations déployée</b>
An expeditionary base that supports the employment and sustainment of deployed forces. (Department of National Defence / Canadian Forces [DND/CF])	Base expéditionnaire qui soutient l'emploi et le maintien en puissance des forces déployées.
Record 23360 <b>expeditionary operation</b>	Fiche 23360 <b>opération expéditionnaire</b>
The projection of military power over extended lines of communications into a distant operational area to accomplish a specific objective. (North Atlantic Treaty Organization [NATO])	Projection de puissance militaire dans une zone opérationnelle éloignée sur des lignes de communication étendues en vue d'atteindre un objectif précis.

<p>Record 34907 <b>expeditionary operation</b></p>	<p>Fiche 34907 <b>opération expéditionnaire</b></p>
<p>The projection of military power over extended lines of communications into a distant operational area to accomplish a specific objective. Note: In the context of aerospace operations, an expeditionary operation is any operation conducted away from the main operating base. Expeditionary operations may be conducted from a domestic, continental or international location. (Chief of the Air Staff [CAS])</p>	<p>Projection d’une puissance militaire dans une zone opérationnelle éloignée sur des lignes de communication étendues en vue d’atteindre un objectif précis. Note: Dans le contexte des opérations aérospatiales, une opération expéditionnaire est une opération qui se déroule loin de la base principale d’opérations. Les opérations expéditionnaires peuvent être menées à partir d’un endroit situé au pays, sur le continent ou n’importe où dans le monde.</p>

The definition for *deployed operating base*, which has been approved for use across the DND/CF, indicates that *deployed* and *expeditionary* are essentially synonymous.

The definition for *expeditionary operation* is sourced from NATO, and since Canada accepts all terms from NATO (unless otherwise indicated), is approved for use across the DND/CF. This definition specifically indicates that *expeditionary* refers to a “distant operational area”; in other words, an area or theatre of operations that is not the same as the domestic one.

The definition for *expeditionary operation* that is sourced from the Air Force (i.e. the CAS), is identical to the NATO one, with the addition of a note that explains that in an Air Force context it is used slightly differently. In this case, the Air Force

considers *expeditionary* to be applicable to “any operation conducted away from the main operating base.” And, since *deployed* and *expeditionary* have already been established to be synonymous, this understanding would also apply to *deployed operation*, although there is not such a definition in the DTB (currently).

**Summary**

Using the online OED as a reference, the terms *deployed* and *expeditionary* are different in concept; however, when used in a military context they are essentially synonymous. Notwithstanding, the Air Force uses both terms differently than the rest of the CF, in that both can apply within the domestic theatre but away from a main base; whereas, in the other environments both apply outside the domestic theatre only.

The sixth Air Force Terminology Panel (AFTP) meeting took place in September, 2010, with 73 terms eventually being approved for inclusion in the DTB. Where a given term has been subsequently modified at the Joint Terminology Panel or the

Defence Terminology Standardization Board for any reason, only the modified version is displayed (in highlight) in order to avoid confusion when accessing the term in the DTB. A listing of the approved terms follows:



English Term & Definition	Définition & Terme français
active data collection	collecte active de données
activity	activité
aerodrome	aérodrome
aerodrome facilities	installations d'aérodrome
Aerospace Medical Authority; AMA	Autorité de médecine aérospatiale; AMA
after-action report	compte rendu post-action
air force function	fonction d'une force aérienne
air mobility	mobilité aérienne
air movements	mouvements aériens
aircraft rescue and fire fighting; ARFF	sauvetage et lutte contre les incendies d'aéronefs; SLIA
Airworthiness Authority; AA	Autorité de navigabilité; AN
Airworthiness Investigative Authority; AIA	Autorité des enquêtes sur la navigabilité, AEN
airworthy	en état de navigabilité
best practice	pratique exemplaire
blue situational awareness; blue SA	connaissance de la situation - bleu; CS bleu
brown situational awareness; brown SA	connaissance de la situation - brun; CS brun
change authority	autorité responsable des changements
change manager	gestionnaire des changements
cognitive hierarchy	hiérarchie cognitive
collection operation	opération de collecte
commander's critical information requirements; CCIR	besoins essentiels du commandant en information; BECI
common operating picture; COP	image commune de la situation opérationnelle; ICSO
consequence management	gestion des conséquences
critical infrastructure protection; CIP	protection des infrastructures essentielles; PIE
critical topics list; CTL	liste des sujets critiques; LSC
decision superiority	supériorité décisionnelle
deliberate operation	opération délibérée
facility	installation
finding	constatation
Flight Test Authority; FTA	Autorité des essais en vol; AEV
force-protection engineering	génie de la protection des forces

fusion	fusionnement
implementer	exécutant
information superiority	supériorité de l'information
informational domain	domaine informationnel
integrated	intégré
investigator	enquêteur
knowledge	connaissance
lesson	leçon
lesson identified; LI	leçon dégagée; LD
lesson learned; LL	leçon retenue; LR
lessons learned officer; LLO	responsable des leçons retenues; RLR
moral domain	domaine moral
observation	observation
operational airworthiness activity	activité de navigabilité opérationnelle
Operational Airworthiness Authority; OAA	Autorité de navigabilité opérationnelle; ANO
operational airworthiness clearance; OAC	autorisation de navigabilité opérationnelle; Aut NO
operational airworthiness function	fonction de navigabilité opérationnelle
operational airworthiness; OA	navigabilité opérationnelle; NO
operationally functional point; OFP	niveau opérationnel de compétence (NOC)
organizational learning	apprentissage organisationnel
passive data collection	collecte passive de données
physical domain	domaine physique
provisional operational airworthiness clearance; POAC	autorisation provisoire de navigabilité opérationnelle; Aut PNO
provisional technical airworthiness clearance; PTAC	autorisation provisoire de navigabilité technique; Aut PNT
readiness level	niveau de disponibilité opérationnelle
red situational awareness; red SA	connaissance de la situation - rouge; CS rouge
regulator	régulateur
reintegration	réintégration
remedial action	action corrective
situational awareness; SA	connaissance de la situation; CS
stabilization activity	activité de stabilisation
statement of operating intent; SOI	énoncé sur l'utilisation envisagée; EUE

Technical Airworthiness Authority; TAA	Autorité de navigabilité technique; ANT
technical airworthiness clearance; TAC	autorisation de navigabilité technique; Aut NT
technical airworthiness function	fonction de navigabilité technique
temporary authority to operate; TAO	autorisation temporaire d'exploitation; ATE
unmanned aerial system; UAS	système aérien sans pilote à bord; UAS
unmanned aerial vehicle; UAV	véhicule aérien sans pilote à bord; UAV
urban search and rescue; USAR	recherche et sauvetage en milieu urbain; RSMU
vulnerability assessment; VA	évaluation de la vulnérabilité; EV
white situational awareness; white SA	connaissance de la situation - blanc; CS blanc

Note: The reader is encouraged to check the CFAWC terminology management (external) website at any time to review the status of candidate Air Force terms: [http://trenton.mil.ca/lodger/CFAWC/Terminology\\_e.asp?Type=BRIEF](http://trenton.mil.ca/lodger/CFAWC/Terminology_e.asp?Type=BRIEF).

*Major Bound, CD, BSc(Hon), is a navigator with 5,200 hours on the CC130 Hercules. In addition to two line tours on operational SAR squadrons, he has also had multiple tours at the Air Mobility operational training unit as a flight instructor and aerospace systems evaluator. Major Bound is currently working in the Doctrine Development Branch at the Canadian Forces Aerospace Warfare Centre. His primary duties include the development of Air Force Move doctrine and the chairmanship of the Air Force Terminology Panel.*

points of interest

# CYBER IS THE COMMANDER'S BUSINESS

By Major Philippe Legere, CD



CF Photo



CF Photo



CF Photo



CF Photo



CF Photo

**A**n Inuit hunting party is stranded on the ice in the Eastern Arctic, wind chill is estimated at -46 degrees Celsius and one member requires immediate medical attention. Fortunately, a CP140 is on patrol nearby in contact with Canadian North American Aerospace Defence Command (NORAD) Region / Canadian Air Defence Sector (CANR/CADS), operating a pre-planned secure high frequency (HF) radio data link. It also has onboard access to Iridium Satellite Phone communications. The call for help arrives in the Joint Task Force (North) joint operations centre. They immediately phone the CANR/CADS mission crew commander (MCC) with the coordinates and request that all the nearest Canadian Forces (CF) assets' "tracks" (track data; location, heading, altitude, speed, etc.) be "pushed" (sent via Internet Protocol [IP] connection) to the CF common operating picture (COP). The CADS MCC receives coordinating instructions from the CANR Combined Air Operations Centre and then choreographs a response. The MCC directs the CADS Regional Interface Control Cell (RICC) to send coordinates to the patrolling CP140 and the CF COP as a data track fixed on the ice floe where the stranded Inuit await, representing a search and rescue event. The RICC also pushes all CF asset tracks within 150 nautical miles to the CF COP via secure IP connection, and to the CP140 via the HF link, as symbology representing track data.



**The CP140 then supports a Transport Canada Ice Patrol Flight which is re-tasked to overfly the area to confirm the Inuit status and position, and to vector in a helicopter to eventually pick them up. Meanwhile, the whole event is viewed as it occurs, in real time, by national authorities and various agencies possessing the CF COP and to those with the Remote Tactical Air Picture connected via a secure IP connection with the CADS Battle Control System. Once again the CANR/CADS stands on guard for all Canadians.**

The above scenario demonstrates how the Royal Canadian Air Force (RCAF) today operates within an information technology-rich environment, touching practically

everything and every member every day. The security and operational necessity of the networks employed in the RCAF require a dependence on freedom of access to and freedom of action within the cyber environment.

The RCAF dependence on the cyber environment to accomplish its mission is an extension of its traditional use and application of leading edge technology. Command and control (C2) systems, weapon systems, and sensors are examples of mission-oriented components that exist within the cyber environment that is integrally involved in the delivery of kinetic and non-kinetic mission effects supporting the commander's intent. Reliance on the cyber environment demands greater vigilance of its current cyber capabilities and the vision



to operationally exploit future cyber potential. The realization of air force mission effects is thereby contingent on operator ownership of its cyber environment. *Cyber is the commander's business.*

The challenge for the RCAF is maintaining the advantage of exploiting rapidly evolving cyber capabilities while countering the numerous inherent vulnerabilities at an equal pace. The cyber threat is asymmetrical, involving state and non-state actors, with a minimal cost of entry, requiring little technical expertise and experience to create effects due to the ease of access and proliferation of online malicious products.

To address the RCAF cyber challenge, the Canadian Forces Aerospace Warfare Centre, in collaboration with the CF Cyber Task Force as well as various RCAF and other Department of National Defence (DND)/CF agencies, is developing an RCAF Cyber Strategic Plan (CSP). The CSP, consistent with the goals set out in the Canada First Defence Strategy and the Government of Canada Cyber Security Strategy, will provide commander's guidance and intent, outlining objectives to help shape RCAF actions over the near future.

### RCAF Cyber Strategic Plan

The CSP will outline RCAF cyber efforts to complement those of other cyber partners, providing maximum benefits to ongoing joint cyber initiatives, and contribute significantly to the national cyber effort. As a result, the intent of the RCAF CSP will be to:

1. position the RCAF to operate within the cyber environment;
2. position the RCAF with enhanced and unique defensive cyber capabilities complementing those under joint DND/CF command and authority ;
3. assure mission success by protecting and defending RCAF cyber systems;
4. establish RCAF cyber requirements and re-engineer acquisition processes; and
5. institutionalize an RCAF cyber culture and mindset.

Also identified in the CSP will also identify objectives for the RCAF to achieve as it moves toward positioning itself as a modern cyber-enabled force. These objectives, as tabled below, will aid the RCAF to prioritize resources and measure the effectiveness of its cyber efforts within the context of the Air Force mission.

<b>Objective 1</b>	<b>Fully integrate cyber capabilities and awareness throughout the RCAF</b>
<b>Objective 2</b>	<b>Identify, educate, train, and employ RCAF personnel to ensure mission essential cyber functions for today and tomorrow</b>
<b>Objective 3</b>	<b>Maximize cyber continuity, availability, and resilience</b>
<b>Objective 4</b>	<b>Establish and/or maintain cyber relationships</b>
<b>Objective 5</b>	<b>Initiate the delivery of cyber capabilities at the "speed of need"</b>

### The Current RCAF Posture

Today's RCAF is a cyber-enabled force, dependent upon mission-critical cyber capabilities and systems on a daily basis. Every air force platform contains a multitude of

sensors, systems, and networks whose linkages into the cyber environment, although transparent to the operator, are very complex yet essential for performing missions within air-to-air, air-to-land and/or air-to-sea environments.

Air force adoption of and operational reliance upon cyber capabilities has evolved over time as they have been integrated to facilitate C2, situational awareness (SA) and intelligence, surveillance and reconnaissance (ISR) collection, and the ability to realize mission effects. Advances in sensors, video compression, and mobile networking also enable the sharing of real-time operational and tactical information that can significantly enhance operational SA at all levels of command. The operational transition to Link 16 and introduction of full motion video, first operationally exploited during Operation PODIUM supporting security for the 2010 Winter Olympics in Vancouver, are allowing for real-time C2 as well as SA of the battlespace to an extent not possible five years ago.

### Future Vision

The CSP should permit the RCAF to realize its determination to exploit the benefits of a cyber-enabled force to ensure an advantage over our enemies, now and into the future, without sacrificing the success of daily national and coalition operations. The RCAF will integrate its cyber capabilities with the whole of DND/CF, other government agencies, NORAD, our Five-Eyes allies, coalition partners, research

and development communities, as well as academia to counter the cyber threat of today and into the future. An RCAF cyber authority, providing operational guidance and direction as well as oversight of cyber service provision requirements, will ensure the effectiveness of the RCAF's current and evolving cyber capabilities. Lastly, the RCAF will foster a culture of cyber defence awareness, instilling a sense of duty by all members in regards to protecting our networks and remaining vigilant to the constant and rapidly evolving cyber threat whether at home or deployed.

### The RCAF Cyber Acculturation

The RCAF cultural mindset must be cognizant of the day-to-day execution of cyber operations. Such a change in mindset will permit effective exploitation of current and future cyber capabilities while countering the rapidly evolving cyber threat. Acceptance of the cyber environment as a recognized reality and the normalization of computer network operations (CNO) concepts as tools in the commander's toolkit are essential for air force mission success. The application of cyber capabilities and effects should also consider within the operational planning process of mission planning and targeting. In addition, the RCAF should exploit to the greatest extent possible the concept of capability integration, recognizing how its own cyber capabilities may leverage or be leveraged by the capabilities of the DND/CF, other government agencies, and allied mission partners. The integration and acculturation of cyber should be apparent in all aspects supporting the RCAF mission,

from the foundations of doctrine development, professional military education and advanced training, C2, readiness training and exercises, war games, and recruitment to the day-to-day operations. Ultimately, it demands leadership at all levels that encourages creative yet critical thinking, and considers innovative activities and solutions.

### Guidance for RCAF Computer Network Operations

The RCAF of today and tomorrow must exploit to the extent possible the full spectrum of CNO in accomplishing its mission. Ensuring the RCAF has the capability to plan for and integrate CNO will be essential for overall mission success. However, the primary CNO focus for the RCAF should be to defend against the cyber threat, in concert with DND/CF cyber initiatives, by organizing, educating, training and equipping a computer network defence (CND) capable force structure to support the RCAF mission. The RCAF understands that the cyber environment is a contested operational area that pervades and enables capabilities and effects in all other environments. The cyber threat is persistent, real time, and inherently global. Therefore, the CSP should position the RCAF to secure and defend its cyber systems, integrating them with other environments to enable joint warfighting effects.

The ability to accomplish the RCAF mission while under attack is essential, requiring an agile and timely response across the RCAF and DND/CF. Consequently, the

RCAF must broaden its focus to defend its unique cyber systems vice simply protecting them. By establishing a determined CND posture the RCAF will be positioned to complement the required full spectrum of CNO, provided by a central DND/CF cyber authority, to counter the immediate and evolving cyber threat. To this end, it is essential that all RCAF members must embrace cyber defence in their daily functions in order to combat the cyber threat.

### RCAF Cyber Strategic Plan Concept of Operation

The RCAF is already entirely interconnected with and dependent upon the cyber environment. Therefore, a CSP will help guide the evolution of the existing mix of RCAF unique and externally provided cyber capabilities into an integrated, normalized, and operationally focused programme of cyber capabilities that will be essential for the conduct of operations. With the goals of implementing a governance structure for RCAF cyber, normalizing cyber concepts within the RCAF, implementing mission assurance and air worthiness to cyber capabilities upon which the RCAF depends, and taking responsibility to defend RCAF unique cyber capabilities, the RCAF CSP should outline a program to be implemented to evolve RCAF cyber over the coming years.

This program should focus on cyber concept development, design development, and implementation actions that will position the RCAF to exploit cyber



operational effects in support of the commander's intent. The RCAF should first evaluate current cyber defence capabilities and confirm any shortfalls while committing to a CND strategy to provide mission assurance and ensuring the airworthiness of cyber systems. Next, the RCAF should put in place measures to develop and sustain an agile and timely CND capability. Finally, the CSP should outline measures to entrench cyber concepts across the RCAF and operationalize its cyber capabilities and support structures.

**Conclusion**

The RCAF is a cyber-enabled force requiring a strategic plan to address its cyber operations in order to effectively sustain mission operations in a cyber-enabled operating environment, positioning itself to counter the cyber threat today and into the future. To this end, the future RCAF CSP will be the mechanism by which the RCAF should develop and sustain an enhanced and unique cyber capability, thereby ensuring mission success into the future. The RCAF should, in concert with its varied cyber partners, continue to evolve and exploit its cyber capabilities, always cognizant of the associated cyber threat, in order to maintain advantage over its enemies. ■

Major Philippe Legere, a communications and electronics engineering – air (CELE[Air]) officer with 29 years' military experience, is a staff member within the Doctrine Development Branch at the Canadian Aerospace Warfare Centre. A graduate of the Royal Canadian Military College of Canada, he has served with 42 Radar Squadron, Cold Lake; North Atlantic Treaty Organization (NATO) Allied Air Force North Ramstein, Germany; Stabilization Force Headquarters (SFORHQ) Sarajevo, Bosnia; Canadian Forces School of Communications and Electronics as second in command (2IC) G Squadron (Technical Training); and Canadian Forces School of Communications (CFSCE) Adjutant; as well as several staff function tours at National Defence Headquarters Ottawa.

**Abbreviations**

C2	command and control
CADS	Canadian Air Defence Sector
CANR	Canadian NORAD region
CF	Canadian Forces
CND	computer network defence
CNO	computer network operations
COP	common operating procedure
CSP	Cyber Strategic Plan
DND	Department of National Defence
HF	high frequency
IP	Internet Protocol
MCC	mission crew commander
NORAD	North American Aerospace Defence Command
RCAF	Royal Canadian Air Force
RICC	Regional Interface Control Cell
SA	situational awareness

# RECOGNIZING ACHIEVEMENT IN CANADA'S AVIATION HALL OF FAME

By John Chalmers

On May 26, 2011, four individuals who have made outstanding contributions to Canadian aviation were inducted into Canada's Aviation Hall of Fame. Also recognized was a special-purpose airline, which was honoured with a Belt of Orion Award for Excellence.

The late Richard W. (Dick) Ryan, who started a career in aviation as a pilot in the First World War and retired as vice-president of Canadian Pacific Air Lines, was represented by his granddaughter, Marji Johns, of Brentwood Bay, British Columbia. Edmonton's Donald T. Hamilton, still flying at 87, is chief executive officer (CEO) of Air Spray (1967) Ltd., an aerial fire suppression company that is a leader in its field.

William J. (Bill) Wheeler of Markham, Ontario served as editor of the *Canadian Aviation Historical Society (CAHS) Journal* for 45 years, and is an accomplished illustrator of aviation articles and books. John W. Crichton of Ottawa, president and CEO of NAV CANADA, has been

honoured several times for his work with the corporation that provides Canada's air navigation services.

Hollinger Ungava Transport (HUT), a special purpose airline established to support the building of a railroad, was represented by John Timmins of Kingston, Ontario, one of the first pilots hired by HUT. Also present was 97-year-old former Second World War pilot Wess McIntosh of Oakville, Ontario, who was hired as chief pilot for the airline.

At the induction dinner gala held in the Canadian Warplane Heritage Museum adjacent to the Hamilton International Airport—a perfect venue for the event with the museum's Lancaster poised in the background—380 people were present for the occasion. CBC broadcaster and pilot Jacquie Perrin served as master of ceremonies. Gerald Haddon, grandson of J. A. D. McCurdy, assisted in the presentations and spoke from the podium about the importance of preserving and recognizing our aviation heritage.



## RICHARD W. RYAN (1896–1992)

Born in Huron County, Ontario, Richard W. (Dick) Ryan was raised on the family farm at Nile, Ontario. In 1916, while attending the University of Toronto, he enlisted for training in the First World War with the University Officers Overseas Training Corps. In 1917, the Royal Naval Air Service called for volunteers; Ryan seized the opportunity and was soon aboard a ship sailing to Liverpool.

In England, the aviators were offered the rank of first lieutenant in the Royal Flying Corps (RFC). After basic training, Ryan was posted as a fighter pilot to RFC Number (No.) 66 Squadron in France, flying the famous Sopwith Camel. In November 1917, in a formation flight, Ryan's aircraft was hit from below by another Camel. The two aircraft locked together and began a spiral dive from 10,000 feet (3,048 metres). Miraculously, they separated, but with no propeller and an engine not working, Ryan made a forced landing and survived. Sadly, the other pilot was killed.

After recovering, Ryan became a flying instructor. In April 1918, the RFC became the Royal Air Force (RAF), and Ryan was assigned to No. 1 Canadian Squadron of the RAF. But his transfer was delayed, and the war ended on November 11. Back home, he graduated from the University of Toronto with a Bachelor of Arts degree in 1920.





In 1922, he earned a teaching certificate from Regina Normal School, taught for a year in a rural school, and then began teaching at Ross Collegiate in Moose Jaw in 1923.

In 1928, he started instructing with the Moose Jaw Flying Club. In 1930, he served as events manager for the first Moose Jaw air show. In 1931, he was manager of the flying club, and in 1932, received a Master of Arts degree from the University of Alberta.

The Moose Jaw Flying Club formed a charter company in 1935, Prairie Airways Ltd., and as business grew, Ryan was hired as manager, resigning from teaching in 1937. With implementation of the British Commonwealth Air Training Plan (BCATP) in the Second World War, No. 3 Air Observer School (AOS) was established in 1941 at Regina, and Ryan was hired as manager.

In 1940, Canadian Pacific Air Lines (CPAL) purchased 10 small airline companies, including Prairie Airways Ltd. Ryan not only managed No. 3 AOS, but he also served as superintendent for the Saskatchewan district of Canadian Pacific Air Lines, with C. H. "Punch" Dickins as general manager. In 1943, No. 3 AOS was closed and Ryan became supervisor of operations for western lines of CPAL. He recommended that the company concentrate on building a scheduled airline service and was appointed as general superintendent of western lines.

In 1945, CPAL began converting Douglas Dakota DC-3 aircraft for passenger service. In 1946, Ryan was appointed general manager of operations, and in 1947, Grant McConachie was appointed as president. By 1948, CPAL had ordered Canadair North Star aircraft for flights across the Pacific.

Soon Ryan became executive assistant to the president. DC-3 service continued in Quebec, but as most operations were in the West serving the Pacific from Vancouver, headquarters moved there, as larger aircraft were put into service, including Douglas DC-6B models.

In 1951, Ryan was appointed by McConachie as vice-president. In the 1950s, international service expanded from Canada to Mexico City, South America, and European cities. In 1956, Ryan became executive vice-president and was put on the board of directors. In 1957, he was elected as president of the Air Industry Transport Association of Canada. In 1961, CPAL entered the jet age with four-engine Douglas DC8-43 aircraft.

At the end of 1961, Ryan reached retirement age, leaving CPAL, but staying on the board until 1965. In 1982, he published his autobiography, *From Boxkite to Boardroom*. Ryan died on November 17, 1992, in Penticton, British Columbia. His life in aviation spanned nearly half a century, from the time of primitive biplanes to the age of jet-propelled airliners.

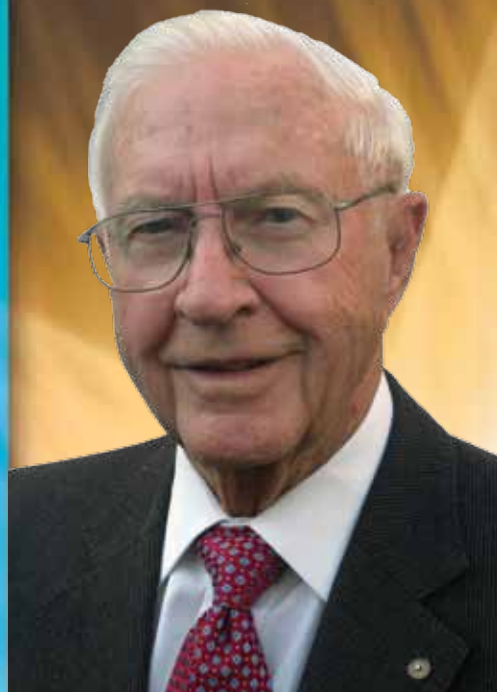


## DONALD T. HAMILTON (1924–)

Donald Hamilton was born at the farm home of his grandparents at Havelock, Ontario. In the mid-1930s, his parents moved to the hamlet of Tilney, Saskatchewan. After graduation from high school, he enlisted in 1942 in the King's Own Rifle Regiment of Canada. In 1943, he transferred to the Royal Canadian Air Force, graduating in 1944 as a bomb aimer at No. 2 Bombing and Gunnery School at Mossbank, Saskatchewan, with the rank of pilot officer. The war ended before Hamilton was sent overseas, but he returned to aviation in pilot training at the Moose Jaw Flying Club in May 1946.

In 1947, Hamilton bought a new two-seater Cessna 120 and had dreams of making a living as a barnstormer. Because he did not have a commercial license, he hired a qualified pilot to take passengers at three dollars a ride at sports days in small towns.

Later in the year, Hamilton flew frozen fish with the Cessna for processing at Cold Lake, Alberta, a town of only 200 people at the time. Returning to Moose Jaw at the end of winter, Hamilton modified the airplane for crop spraying. In 1948, he returned to Cold Lake, starting a charter service to fly fish, passengers, and cargo to Cold Lake, Hay River, and Great Bear Lake.



In 1950, Hamilton purchased a Stinson 108-2, using it to transport government personnel for aerial survey work in locating a site for what would become the Cold Lake Canadian Forces base. With construction under way by 1951, Hamilton was kept busy with air charter service between Edmonton and Cold Lake. Two more aircraft were acquired, a Cessna 195 and an Avro Anson Mark V. When the base was completed, with no further need for Hamilton's services, the Stinson and the Cessna were sold.

During construction of the Distant Early Warning (DEW) Line inside the Arctic Circle, Hamilton was hired by Tommy Fox of Associated Airways in Edmonton to carry freight and passengers from DEW Line northern headquarters at Cambridge Bay, and the Anson was put back in service.

In 1956, Hamilton flew Ansons and Beavers for Standard Oil and sold aircraft for Gateway Aviation in Edmonton. He helped establish Aero Engineering in a wartime hangar for maintenance and repair to serve small operators. He sold out to his partners in 1958 and established Hamilton Aviation, selling Helio Courier and Dornier aircraft while still providing charter service. He continued hauling fish in northern Alberta, and to carry bigger loads acquired a Fairchild 82. In 1987, Hamilton built his own facility, the General Aviation Centre, at Edmonton City Centre Airport.

In 1969, Hamilton became a partner in Air Spray (1967) Ltd., helping launch the company into forest fire suppression with a B-26 Invader bomber converted to carry fire retardant. Hamilton flew a Cessna 310 as a "bird dog" to lead the bomber into firefighting areas. In 1972, he bought out his partner. In 1974, operations moved to the Red Deer Regional Airport, the site of the wartime BCATP station at Penhold. Air Spray had contracts to operate provincial government aircraft and also increased its own fleet. By 1990, Air Spray was operating fifteen B-26 Invaders, three Canadair 215s, two Cessna 340s, three Aerostars, and a Cessna Citation executive jet. Staff had grown to 60 pilots, as well as support and maintenance personnel.

To increase capacity for firefighting, Hamilton selected the Lockheed Electra L-188, powered by four turboprop engines. Eight of them, accompanied by Gulfstream twin-engine turboprop aircraft for bird dog duty, comprise the largest such fleet in North America.

In 2000, the company's wartime BCATP hangar burned down, with the fatal loss of an engineer and six aircraft. It was a serious setback, but Air Spray recovered when Hamilton built a modern 97,000-square-foot hangar on the same site in 2001. Hamilton continues to be active in the business as CEO, working from his Edmonton office. He still flies his Cessna 340, over 65 years after starting a lifetime in aviation.



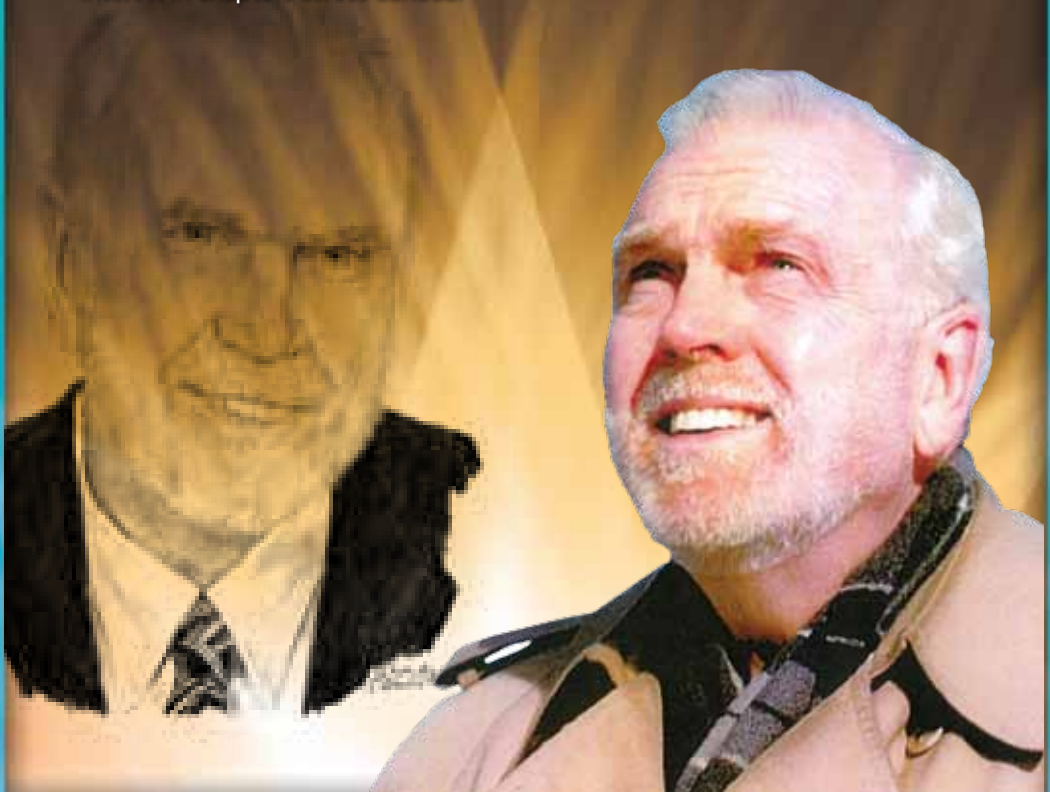
## WILLIAM J. WHEELER (1931–)

Long-time editor of the *CAHS Journal*, William J. (Bill) Wheeler was born in 1931 in Port Arthur, Ontario, and attended school at Central Public School. His father, the city architect, designed and supervised the construction of the school in 1909. By the time he completed Grade 13 at Port Arthur Collegiate in 1950, like many boys who grew up during the war years, Wheeler had developed an interest in aviation.

In 1955, Wheeler graduated from the Ontario College of Art with an Associate of Ontario College of Art diploma and worked as a freelance illustrator during the early 1960s, with assignments from aircraft manufacturer de Havilland and various publishers, creating illustrations of aircraft and ships.

In 1958, for publisher Macmillan of Canada, Wheeler illustrated a book on First World War flying called *Knights of the Air: Canadian Aces of World War I*, which went through eight printings and two editions. In some ways that book foreshadowed aspects of Wheeler's own future. It was his first aviation publication, and it included stories of pilots who have since been inducted into Canada's Aviation Hall of Fame.

In 1962, meetings were held at Wheeler's home to discuss the formation of an organization to address the significance of aviation in Canada, and Wheeler became one of the founding members of the CAHS in 1962. Starting in 1963, for 45 years as volunteer editor, he published the *CAHS Journal*. Under his direction it grew to become the foremost journal of Canadian aviation history. Its readership is one of the most important ties that bind together CAHS members with a shared common interest in chapters across Canada.



Wheeler's abiding interest in art and his passion for aviation history have been instrumental in producing a publication in which a thousand stories, thousands of pictures, and cover art by some of Canada's best-known aviation artists have been shared with *Journal* readership. In producing the *Journal* in over four decades, Wheeler has himself become one of Canada's most knowledgeable aviation historians.

In the late 1960s, Wheeler furthered his education with completion of a Bachelor of Fine Arts degree from the University of Toronto. Starting with the Scarborough Board of Education, now part of Toronto's educational system, he taught for 28 years, serving as head of the art department. He retired from teaching at West Hill Collegiate in 1994.

Serving as an unpaid editor for a quarterly publication, and recruiting writers and artists to share their work can be a tedious job. However, Wheeler says personal rewards included the opportunity to define and shape the *Journal*. He has also served as president of the CAHS and provided many illustrations for the magazine.

His dedication was instrumental in recognition given to the CAHS by Canada's Aviation Hall of Fame, which bestowed the Belt of Orion Award for Excellence upon the historical society in 2001. Wheeler himself has been recognized by his readers to receive an annual CAHS Mac McIntyre Award for the best-researched article to appear in the *Journal*.

Wheeler has published four other aviation books. *Images of Flight* (1992) is a portfolio of paintings by Canada's best-known aviation artists. *Skippers of the Sky* (2000) is a selection of stories about bush pilots that first appeared in the pages of the *CAHS Journal*. Volume 1 of *Flying Under Fire* (2000) and Volume 2 (2004) are aviation stories from the Second World War.

In 2008, Wheeler was approached by the Toronto chapter of the CAHS to produce a special edition publication celebrating Canada's Centennial of Powered Flight. It is a 40-page account of Canadian aviation history and was widely distributed by aviation museums in North America. The volume was a fitting cap to nearly a half-century of Wheeler's work in sharing important aviation stories in an unmatched contribution to the published word for present and future generations.



## JOHN W. CRICHTON (1946–)

Ottawa native John Crichton was born November 15, 1946. He developed a passion for aviation from his father, who had served as an RCAF flying instructor in Canada during the Second World War. Crichton earned his private pilot's license in 1967, and managed the Ottawa Flying Club while enrolled in journalism at Carleton University, during which time he earned a commercial pilot's license.

He left university to fly for Bradley Air Services Limited, which provided charter services to the high Arctic. In 1973, Bradley formed a new operation called First Air, and with it Crichton established scheduled air service across the North, introduced jet service from Ottawa, and expanded turboprop routes in northern Canada. As executive vice-president of First Air in the 1980s and early 1990s, he was a guiding force behind expansion of air service in northern Canada.

In 1994, Crichton left First Air to become president and CEO of the Air Transport Association of Canada (ATAC). In that capacity, he influenced government policy and was a key advisor to Transport Canada. As president of ATAC, he spearheaded the privatization of Canada's air traffic control and navigation services. He brought together diverse interests of government, commercial aviation industry, unions, and general aviation in the creation of NAV CANADA.

In 1997, Crichton became president and CEO of NAV CANADA, one of the world's few fully private air navigation services. Since then, he has built the corporation



into one of the most modern and efficient air navigation systems in the world. The corporation now has 4,900 employees at 130 staffed sites across Canada. It is Canada's civil air navigation services provider, delivering air traffic control, flight information, weather briefings, aeronautical information services, airport advisory services, and electronic aids to navigation.

The corporation's innovations include the northern radar program and in-house development of air traffic management systems, including an air traffic surveillance system called Automatic Dependent Surveillance – Broadcast (ADS-B). It provides benefits for aircraft over the Hudson Bay region, expanding the capacity for this area of 250,000 square nautical miles (402,336 square kilometres [km]) flown by several international routes.

In 2006, NAV CANADA received the J. A. D. McCurdy Award from the Air Force Association of Canada for the company's "outstanding achievements in the field of civil aviation in Canada, in particular for the delivery of safe, efficient, and effective civil air navigation services across the country and in international airspace assigned to Canada."

In 2010, NAV CANADA was honoured with the Eagle Award from the International Air Transport Association, representing the world's international airlines. The award is given to recognize the Best Air Navigation System Provider. NAV CANADA had previously received the Eagle Award in 2001.

Under Crichton's leadership, NAV CANADA has built a global reputation for safety, efficiency, and a wide-ranging program that has seen the company's technology sold on a commercial basis to other air navigation providers. In-house talent—working with operational employees in the field—continues to develop NAV CANADA's own proprietary systems. These include trans-oceanic air traffic control systems, an automated tower terminal electronic-flight-strip system, and touch screen electronic technology. Such developments have been sold to air navigation service providers on three continents—North America, Europe, and Australia.

Crichton himself has been honoured for his work. In 2006, he was selected as Transportation Person of the Year by the Transportation Association of Canada. In 2008, he received the Glen A. Gilbert Memorial Award from the Washington, DC-based Air Traffic Control Association for lifelong achievement of an individual in aviation. In 2009, he was awarded the C. D. Howe Award from the Canadian Aeronautics and Space Institute for his lasting contributions to Canada's aviation industry.

Crichton is regarded as a skilled and effective manager with a deep understanding of the airline industry and the ability to bring parties together for a common purpose.



## HOLLINGER UNGAVA TRANSPORT (1948—1954)

Hollinger Ungava Transport Ltd. (HUT) was an air transport service created to fulfill a unique function. HUT was an airline that used mainly Douglas DC-3 aircraft that were veterans of the Second World War to build another transportation system, a special purpose railroad.

The airline was formed in 1948 as a subsidiary of the Iron Ore Company of Canada (IOC) to transport personnel and freight during the construction of the Quebec North Shore & Labrador Railway (QNS&L).

Hollinger North Shore Exploration planned construction of a railroad from Knob Lake, Labrador, to the port at Seven Islands (Sept-Îles), Quebec, on the north shore of the Gulf of St. Lawrence. The railroad would run 360 miles (580 km) from Sept-Îles north to the open pit mine at Burnt Creek, just inside the Quebec border near Knob Lake (later known as Schefferville) in the Ungava district. The railroad would transport iron ore to Sept-Îles, to be then carried by ship to steel mills in the United States and other parts of Canada. The slogan for the project was "Ore by '54."

Mont-Joli, Quebec, 350 miles (560 km) east of Montreal, served as HUT's main operating base. Mont-Joli had a well-equipped airport used by the RCAF from 1941 to 1945 for training and maritime patrol during the war. Starting in 1948 with two Douglas DC-3 aircraft, HUT eventually operated a fleet of ten, plus several other types of aircraft. At its peak, HUT averaged 70 flights per day, using 80 pilots with



PD Photo

crews that flew an average of 1,000–1,200 hours per year. Over 100 mechanics, radio operators, and other technicians were among the large supporting staff.

The DC-3s flew around the clock, with only three non-flying days scheduled per year—New Year’s Day, Easter Sunday, and Christmas Day. Blowing snow, poor visibility, poor runway lighting, and a cold winter for seven to eight months were among the conditions that made flying a challenge.

In 1952, when winter roads failed to support the loads that travelled on them, the IOC moved to build the railroad from the air. Eventually, a dozen airstrips were built. Additional aircraft were acquired and chartered, and HUT was soon supporting 7,000 men on the railroad project.

In 1953, the DC-3s delivered cement and steel to build the dam and spillway near Knob Lake across Guy’s River. When completed, the dam would also serve as a bridge for ore trains. By early 1954, the dam was providing electrical power to the mine.

As the railroad neared completion, using DC-3s and one Canso, HUT in 1953 flew more than 18,000 hours and carried 68 million pounds (28,123 metric tons) of cargo, more than the combined cargo carried by all other Canadian airlines that year. From 1948 to 1954, HUT flew over 55,000 hours in 24,077 flights and carried 163 million pounds (73,936 metric tons) of cargo. By the end of 1953, over a thousand people were working at the Burnt Creek mine, where open pits were producing and storing ore waiting for completion of the railroad and transport to the seaway.

On February 17, 1954, at Burnt Creek in –52 degrees Fahrenheit (-46 degrees Celsius) weather, the last spike was driven, symbolizing the completion of the QNS&L. By July 1954, the railroad would run nine 100-car ore trains each day, operating fully automatically and without crew, between the mine and the port at Sept-Îles. At that point, ore cars were emptied into ships to transport ore to steel furnaces in Canada and the United States.

The first shipment of iron ore was loaded onto an ore carrier at Sept-Îles on July 31, 1954. The arrival of the ore from the mine was celebrated at Sept-Îles with Joey Smallwood, premier of Newfoundland; Maurice Duplessis, premier of Quebec; and George M. Humphreys, chairman of M. A. Hanna Coal and Ore, who was also Secretary of the Treasury of the United States. HUT had completed its task on time, and “Ore by ‘54” had become a reality.



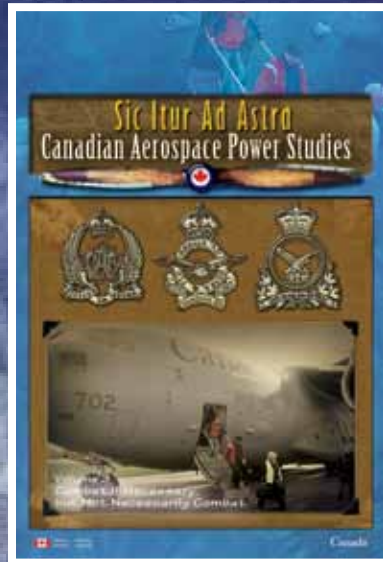
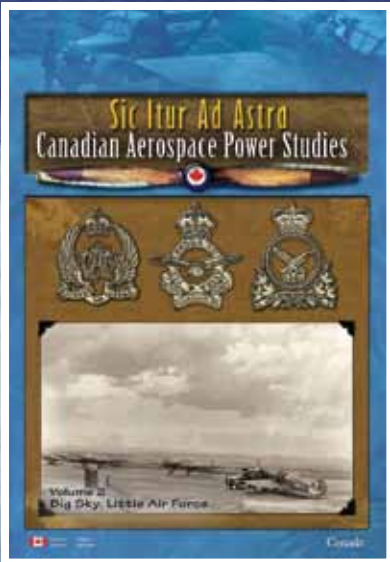
Each year, Canada's Aviation Hall of Fame, located at the Reynolds-Alberta Museum in Wetaskiwin, Alberta, recognizes outstanding individuals for their accomplishments. The Belt of Orion Award is given to organizations that have made important contributions to Canadian aviation. The CAHF web site at [www.cahf.ca](http://www.cahf.ca) provides details regarding nominations, as well as information on all members and Belt of Orion recipients inducted into the Hall of Fame. Biographical notes at the site are illustrated by original portraits created by Toronto artist Irma Coucill, who has now drawn portraits of the Hall's 204 inducted members. ■

John Chalmers is an Edmonton writer who serves as historian for Canada's Aviation Hall of Fame. He is a board member of the Alberta Aviation Museum in Edmonton, a national CAHS member and a member of the CAHS Ottawa chapter.

**Abbreviations**

AOS	air observer school
ATAC	Air Transport Association of Canada
BCATP	British Commonwealth Air Training Plan
CAHS	Canadian Aviation Historical Society
CEO	chief executive officer
CPAL	Canadian Pacific Air Lines
DEW	Distant Early Warning
HUT	Hollinger Ungava Transport
IOC	Iron Ore Company of Canada
km	kilometre
No.	number
QNS&L	Quebec North Shore & Labrador
RAF	Royal Air Force
RFC	Royal Flying Corps

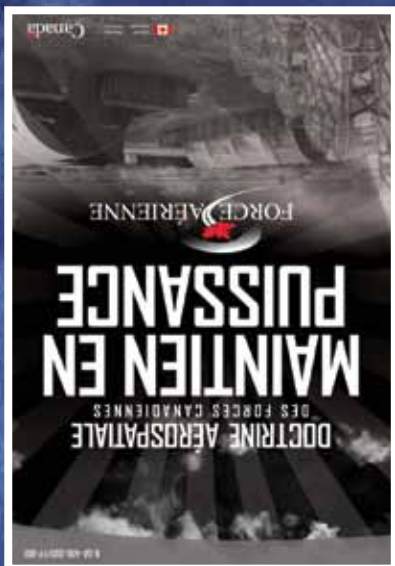
# ORDER YOUR BOOKS NOW!



THESE PUBLICATIONS ARE AVAILABLE UPON REQUEST  
email: [anne.pennington@forces.gc.ca](mailto:anne.pennington@forces.gc.ca)



**POUR DES COPIES DE CES PUBLICATIONS, FAITES VOS  
DEMANDES À L'ADRESSE SUIVANTE :  
anne.pennington@forces.gc.ca**



**COMMANDEZ VOS  
LIVRES MAINTENANT!**