SPRING 2010
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THE CANADIAN AIR FORCE JOURNAL

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AFGHANISTAN 2009

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PROVIDING ESSENTIAL SUPPORT TO CANADA'S MISSION IN AFGHANISTAN

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A SOLDIER FIRST:
BULLETS, BUREAUCRATS AND THE POLITICS OF WAR

THE SCIENCE OF BOMBING:
OPERATIONAL RESEARCH IN RAF BOMBER COMMAND

AND MUCH MORE!

PRODUCED BY
THE CANADIAN FORCES AEROSPACE WARFARE CENTRE

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ASSISTANT EDITORS

Ernie Alkenbrack , Adri Boodoosingh and Françoise Romard

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Denis Langlois and Luc Leroy

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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

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THE CANADIAN AIR FORCE JOURNAL

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Item	Word Limit*	Details
Letters to the Editor	50-250	Commentary on any portion of a previous *Journal*.
Articles	3000-5000	Written in academic style.
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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

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Photo: Cpl Lou Penney

EDITOR'S MESSAGE

I don't normally start my comment page with an apology, but in this case I think it most apropos. The theme of this issue of the *Journal* is a look at the Air Force (AF) in Afghanistan, and I want to thank everyone who has contributed; however, for a variety of reasons we were not able to obtain material on all of the units and personnel involved in the conflict. This was not done by design. Therefore, I encourage readers to treat this issue as a snapshot rather than a comprehensive overview of AF activity in theatre. It is my sincere goal to rectify these omissions through the publication of additional articles in the future.

Just in case anyone is keeping score, our current engagement in Afghanistan is the fourth time that the Canadian Air Force (CAF) has gone to "war" since 1945. You have to use the word "war" loosely since it has fallen out of vogue to describe the process of sending Canadian men and women into harm's way in order to achieve government policy by force of arms as going to war. Nevertheless, I would argue that every man and woman who participated in any one (in some case more than one) of these conflicts had little doubt that they were "at war" regardless of the political and legal niceties.

Barely five years after the end of the Second World War (WWII), Canada fought under the United Nations' (UN) banner in Korea. The nation's main contribution to this conflict was made by the Army, and the naval effort was equally impressive.[1] Reflecting the organizational dictates of the time, both of these services had air elements. Beginning in 1952, air observation post (AOP) pilots belonging to the Royal Canadian Artillery were posted to Korea. Flying Auster aircraft, their job was to direct artillery fire in support of UN ground forces. An extremely hazardous occupation, one AOP pilot was shot down and spent time as a Chinese prisoner-of-war, and another, Captain Peter Tees, became the first Army officer since the First World War to be decorated with the Distinguished Flying Cross—the last one to be awarded to a Canadian.[2]

Involvement by maritime aviators from the Royal Canadian Navy was more limited. Lieutenant-Commander P. Ryan was dispatched to Korea as an observer and worked for the United States Air Force (USAF) as a forward air controller and flew as a backseater in AD-4Q Skyraiders operating from the United States Ship (USS)

Philippine Sea.[3] One other naval aviator flew combat missions with the United States Navy flying the F9F-2 Panther on combat air patrols (CAP), fighter-bomber missions, photo-escort, flak suppression, close air support (CAS), and armed reconnaissance.[4]

Involvement by the Royal Canadian Air Force (RCAF) in Korea was dictated by its commitment to the North Atlantic Treaty Organization (NATO). Airlift was the primary focus of AF operations, and 426 Squadron undertook the bulk of the flights. As well, 22 fighter-pilots served on exchange with the USAF flying F-86 Sabres. A number of air-to-air victories were scored by these individuals, and one, Squadron Leader Andy MacKenzie, was shot down in December 1952 and spent two years in captivity.[5]

Less well known was the contribution by AF specialists to Canada's efforts in Korea. Thirteen RCAF nursing sisters served in the theatre on board US and Canadian medical-evacuation flights. AF radar and intelligence specialists were dispatched to Korea periodically to assist in, and to learn from, ongoing operations. These individuals included Group Captain K.R. Patrick, the only Air Reservist to serve in Korea, who was sent to learn what he could about communist radars and electronic counter-measures. Flying in USAF B-29s over North Korea on one mission, two of the five aircraft involved were shot down, and on another three of five failed to return.[6]

In many ways, the Korean experience served as a template for AF involvement in post-WWII conflicts; the bulk of the effort was dedicated to air transport with a smattering of specialists scattered throughout the theatre. However, with the advent of new technologies, most notably related to intelligence, surveillance and reconnaissance (ISR), and precision guided munitions (PGMs), there has been a trend to increased reliance upon air power as a national contribution to emerging conflicts. As well, with unification in the 1960s, air power contributions that had fallen under the auspices of the Army and Navy became elements of a growing air force presence.

The first post-unification conflict wherein the air element of the Canadian Forces (CF) was engaged was the first Gulf War (1990–91). Operation FRICTION was the name given to Canada's contribution and it revolved for the most part around naval and air task groups.[7] Prior to the sailing of Task Group (TG) 302.3 from Halifax on August 24, 1990, the Sea King helicopters had to go through a whirlwind of modifications to bolster their capabilities. When the five aircraft flew past Her Majesty's Canadian Ships (HMCS) TERRA NOVA, ATHABASCAN, and PROTECTEUR that day, it was claimed that "eighteen months of peacetime work had been accomplished in eight days."[8] The embarked air and ground crews of TG 302.3 would find themselves extremely busy in the months that followed, helping to enforce a naval embargo and then supporting combat operations.

On September 14, 1990, Prime Minister Brian Mulroney announced that a fighter squadron would be sent to the Gulf Region to support allied efforts. The responsibility to mount what became known as the Canadian Air Task Group - Middle East (CATGME) fell to 4 Wing, Baden-Söllingen, Germany. The initial combat element would be the CF18s of 409 Squadron, before being replaced by aircraft and personnel from the 416 and 439. Once in theatre, the air, ground and support personnel would become collectively known as the "Desert Cats." All told, CATGME deployed with over 550 personnel.[9] Initially, the multi-role fighters provided CAP for coalition naval forces, but with the start of hostilities on January 17, 2001, the mission-set grew to include escort, sweep, and, eventually, bombing missions.[10]

Throughout the entire conflict the CC130s and CC137s (the Boeing 707) of Air Transport Group, operating out of Canada and Europe, conducted almost non-stop airlift operations. By the time the bulk of the CF had returned from the Gulf, 5, 616.4 tons of material had been transported either to or from theatre along with thousands of personnel.[11] In addition to the cargo and passenger duties,

the tanker versions of the CC/T137 also conducted air-to-air refuelling of Canadian and coalition aircraft throughout the campaign.

Unfortunately, the current histories were unable to capture all of the other AF contributions to this conflict. For instance, the first Canadian airmen and airwomen in theatre were serving onboard NATO or USAF Airborne Warning and Control Aircraft (AWACs). As well, there was a scattering of Canadian air personnel serving in coalition air units, serving at various headquarters, or providing essential support to operations in a myriad of ways. It was truly a major AF operation.

Less then a decade later, the AF would find itself in combat again; this time in European skies for the first time since May 1945. As part of the NATO force operating out of Aviano Air Base, Italy, CF18s would be part of the campaign to evict Serbian forces from the disputed province of Kosovo. Commencing in March 1999 and ending 78 days later, the campaign would see the Canadian fighters conduct a total of 678 combat missions, the majority of which involved flying combat air patrols and delivering PGMs.[12] Aircraft from 3 Wing, Bagotville, Quebec, and 4 Wing, Cold Lake, Alberta, would be located at Aviano, supported by a composite formation made up of servicing, maintenance, and armament personnel from both units.

Once more, the first AF personnel to find themselves "in the fight" were aboard NATO AWACs, and, again, the lifeline for ordnance, personnel, and supplies was maintained without interruption by AF transport elements. With this campaign fought in NATO's backyard, numerous Canadian airmen and women within the Alliance's command and control, policy and intelligence structures became engaged in the campaign. From an AF perspective, it was bloodless, but not effortless.

Two years later and the CF was in combat yet again. Only this time, while the conflict for us has been centred in the Gulf region and Southwest Asia, the terrorist dimension has given it a world-wide element. So far our involvement in our first conflict of the 21st century has all of the hallmarks of those the AF fought in during the last 50 years of the 20th. Maritime air, both fixed and rotary, has been deployed either constantly or for specific missions since 2001. Air transport resources and personnel, albeit with the new CC177 [C17], continue to fly long hours conducting strategic and tactical airlift missions. Although no fighter aircraft have been deployed, Canadian fighter pilots are integral members of tactical air control parties engaged in directing airborne firepower in support of ground operations. Tactical helicopter aircraft and personnel, in direct support of Canadian and Allied ground forces, continue to take the fight to the insurgents' backyard, while a new capability—unmanned aerial vehicles— have allowed us to increase our awareness and precision attack. AWACs personnel continue to be amongst the first into a conflict, and there is still a large number of administrative, support, maintenance, and staff personnel scattered among the various agencies, headquarters, and formations. In the fullness of time, I hope that there will be a comprehensive history written of the Joint Task Force Afghanistan Air Wing; in the meantime, perhaps the articles in this issue of the *Journal* will help fill the void; for the AF's fourth conflict since the end of WWII has been neither effortless nor bloodless.

Major William March, CD, MA

Senior Editor

List of Abbreviations

AF	Air Force
AOP	air observation post
AWAC	Airborne Warning and Control Aircraft
CAF	Canadian Air Force
CAP	combat air patrol
CAS	close air support
CATGME	Canadian Air Task Group - Middle East
CF	Canadian Forces
HMCS	Her Majesty's Canadian Ship
NATO	North Atlantic Treaty Organization
PGM	precision guided munitions
RCAF	Royal Canadian Air Force
TG	Task Group
UN	United Nations
USAF	United States Air Force
USS	United States Ship
WWII	Second World War

Notes

1. There are several excellent books available on the Canadian Army's participation in the Korean War. I suggest William Johnston's *War of Patrols: Canadian Army Operations In Korea* (Vancouver: University of British Columbia Press, 2003) and Brent Watson's *Far Eastern Tour: The Canadian Infantry in Korea, 1950-1953* (Kingston: McGill-Queen's University Press, 2003) as good places to start. A good place to start with for Canadian naval exploits is Edward Meyers' *Thunder in the Morning Calm* (St. Catharines, ON: Vanwell Publishing, 2003).

2. Carl Mills, "Canadian Airmen in the Korea War: Participation and Training Aspects" in 1 Canadian Air Wing Headquarters, Office of Air Force Heritage and History (hereafter AFHH), *Canada's Air Force from Peace to War*, the proceedings of the 6th Annual Air Force Historical Conference, 21-23 June 2000, Cornwall, Ontario, 134-5. Published information on Canadian Army aviators in Korea is hard to come by. I suggest D.L. Fromow's *Canada's Flying Gunners* (Ottawa: AOP Association of Canada, 2002) or John Melady's *Korea: Canada's Forgotten War* (Toronto: Macmillan of Canada, 1988).

3. Ibid., 132. For further reading on Canadian naval aviation in Korea, I suggest Stuart Soward's *Hands to Flying Stations: A Recollective History of Canadian Naval Aviation*, Vols. 1 and 2, (Victoria: Neptune Developments, 1993 and 1995).

4. Ibid., 135.

5. Ibid., 139-140. Unfortunately, not much has been written on Air Force operations in Korea, although Carl Mills, the individual whose work I have pillaged for this article, is working on a book. Two readily available sources are Larry Motiuk's *Thunderbirds for Peace: Diary of a Transport Squadron* (Ottawa: Larmot Associates, 2004) which provides a detailed examination of 426 Squadron during the conflict and Larry Milberry's *Canada's Air Force at War and Peace*, Volume 3 (Toronto: CANAV Books, 2000).

6. Ibid., 134.

7. The best overall look at the CF in the first Gulf War is Jean Morin and Richard Gimblett's *Operation Friction: The Canadian Forces in the Persian Gulf* (Toronto: Dundurn Press, 1997).

8. Ibid., 46.

9. Ibid., 97-111.

10. Ibid, 151-178. For a more candid look at Canadian fighter operations during the first Gulf War see David N. Deere, ed., *Desert Cats: The Canadian Fighter Squadron in the Gulf War* (Stoney Creek, ON: Fortress Publications, 1991).

11. Morin and Gimblett, 271.

12. Unfortunately, there is no history of the Canadian effort during the Kosovo Air Campaign. I recommend seeing Lieutenant-Colonel David L. Bashow et al, "Mission Ready: Canada's Role in the Kosovo Air Campaign" in *The Canadian Military Journal*, Vol. 1, No. 1, Spring 2000, 55-61.

LETTERS TO THE EDITOR

2 Jan 2010

Dear Col Dabros,

I've recently reread the article "Leadership: The Air Dimension", in the 2009 Winter edition of the *Canadian Air Force Journal*. I'm still greatly disappointed to not learn from it how the Air Force today defines and develops leadership. I admit, the article told me a lot about what others think and preach, but little if anything, about our Air Force's leadership credo.

Anyway, having been so blunt and critical, and to spur your hormones, here's what I think leadership is.

Leadership is the ability some humans possess to inspire others to achieve goals. The leader may have played a role in establishing the goals, but often their achievement is not in his hands. Yet, in his exercise of leadership he may manage how they are achieved.

A great leader may be a good manager. But some of the world's great leaders were lousy managers! Churchill, for example!

What do you guys think?

W. K. Carr, Lt-Gen (Long Retired)

Letters to the editor are welcomed and must include the author's name, rank and position. Include a phone number for verification. We reserve the right to edit while preserving the main objective of the writer. We cannot guarantee that any particular letter will be printed. Mail, e-mail or fax to the *Journal*'s Senior Editor.

For further information please contact the Senior Editor at: William.March@forces.gc.ca

16th Annual Air Force Historical Workshop

1-2 June 2010

Sainte-Anne-de-Bellevue (Montreal), Quebec, Canada

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Colonel Ernest Cable (Retired), Shearwater Aviation Museum

Building RCAF Arctic "Air Mindedness"
Dr. Richard Goette, Queen's University

Frigid Ambitions: The Venture of the Alert Wireless Station and Lessons Learned for the Canada First Defence Strategy
Ms. Rachel Heide, Directorate Future Security Analysis

Sovereignty For Hire: Civilian Contractors and the Distant Early Warning (DEW) Line
Mr. Daniel Heidt (with Dr. P. Whitney Lackenbauer), University of Western Ontario

Creating a Role: The Air Force in the Arctic, 1945-1953
Mr. Peter Kikkert, University of Western Ontario

At the Crossroads of Militarism and Modernization: Inuit-Air Force Relations in the Cold War Arctic
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A Joint Solution to a Strategic Threat: The RCAF and the Mobile Striking Force, 1948-1955
Major Ray Stouffer, Royal Military College

And more....

Attendance at the Workshop is open to all and additional information on the event can be found at www.airforce.forces.gc.ca/cfawc/index_e.asp or by contacting Major Bill March at 613-392-2811 ext 4656 william.march@forces.gc.ca. Of note, the Canadian Aviation Historical Society annual convention will be held at the same location, 3-5 June 2010.

Editor's Note: Due to a number of reasons, the 2010 Air Force Historical Workshop has shifted dates / location. It will take place on **1-2 June 2010, at John Abbott College, Sainte-Anne-de-Bellevue, Quebec (Montreal).** For additional details, speakers and registration information see the CFAWC website.

Major Bill March • 613-392-2811 poste/ext 4656 • william.march@forces.gc.ca

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CF Photo

Kandahar Airfield

Afghanistan, June 2009

By Captain Ron Busch, CD and Captain François Lavertu

In preparation for a potential deployment to Afghanistan, the first Canadian Air Force helicopter pilots and crews started learning to operate the CH47D Chinook in Fort Rucker, Alabama, over 15 months ago. The decision to train crews on the Chinook helicopter was made after the publication of the Manley Report. One of the conditions of the Manley Report was that Canada should remain in Afghanistan beyond February 2009 provided that the government secure new, medium-lift helicopters and high-performance unmanned aerial vehicles by February 2009.

CF Photo

Since March, 2008, training has been almost continuous for Air Force personnel in order to meet this requirement. On December 6th 2008, the first ever Joint Task Force – Afghanistan (JTF-Afg) Air Wing stood up at Kandahar Airfield. One of the main goals of the Air Wing is to increase the safety, security and capability of Canadian and Allied troops in Afghanistan by using helicopters to transport people and cargo over some of the most dangerous terrain in the country.

Final operational capability (FOC) declaration means that the skill of the crews is such that they are capable of conducting the full spectrum of aviation combat missions—from basic command and liaison, overwatch, passenger transport, and resupply missions, to night-time combat troop insertions

December 6th 2008 was an equally historical moment for Canada's Air Force with the stand-up of the Canadian Helicopter Force–Afghanistan (CHF(A)), a unit composed of 200 people, eight CH146 Griffons and six CH147 Chinooks. The month of May 2009 will surely be remembered as another important milestone for Canada's contribution in Afghanistan as it is when the CHF(A) CH147 Chinook Flight achieved its final operational capability (FOC), meaning that all of CHF(A) was now mission-ready. The FOC declaration means that the skill of the crews is such that they are capable of conducting the full spectrum of aviation combat missions—from basic command and liaison, overwatch, passenger transport, and resupply missions, to night-time combat troop insertions into the heart of the insurgents' hiding places. Even before declaring this capability, CHF(A) with its six CH147 Chinook helicopters had taken part in many challenging missions in direct support of Canadian troops in Kandahar province, and in support of other coalition forces working in other provinces in the south of Afghanistan. Their performance during these operations showed clearly that they were now ready to tackle almost any mission in the Afghan theatre.

The first real display of this newly declared capability came less than two weeks after FOC for the CH147 Flight was announced. Op KATAKAWAL was the first Canadian planned and flown helicopter air assault mission in Afghanistan. During this operation, a full company of Canadian and Afghan soldiers were airlifted, under the cover of darkness, by Canadian Chinooks into the heart of the dangerous Zhari district. Despite the fact that there was no moon and that the illumination level was at its minimum, the CH147 Chinooks, escorted by Canadian CH146 Griffons, delivered the troops on time and on target and allowed them to disrupt the insurgents in this key area. The Canadian-operated Heron Unmanned Aerial Vehicle (UAV) also contributed to the success of this operation by providing overwatch and alerting helicopter crews and ground forces of potential danger. During the operation, ground troops encountered strong resistance from the insurgents, but by all accounts, the insertion and the extraction of the combat elements was a resounding success.

Little more than 24 hours after Op KATAKAWAL, Canadian Chinook crews travelled to Helmand province in order to participate in Op OUBA 3, led by the British forces. The commander's intent in this operation was to disrupt the insurgent activity and drug production in the Upper Sangin Valley region. For this operation, two Canadian Chinooks alongside four British counterparts took part in a battle group size insertion, once again, under the cover of darkness. Although escorted by attack helicopters, insurgents engaged the Chinooks multiple times with small arms, rocket propelled grenades (RPGs), and heavy machine-gun fire both en route to the objective and at the objective area itself. The crews manoeuvred, returned fire, and fought through the insurgent attacks and successfully delivered their troops to the objectives as planned. The ground operation was a huge success and the extraction of all troops approximately 30 hours later went without a hitch. No damage or injury resulted to any of the aircraft or aircrew involved. The insurgents, however, learned that even what they believe to be safe-havens are not out of the reach of Canadian and coalition aviation.

Following is an extract of the experience of one of the CH147 pilots (Captain Ron Busch) in theatre.

Photo: Cpl James Nightingale

"I have been here just over two months and it has been an experience. Temperatures have been in the mid- to hi- 40s with an ever-present dust. The dust makes things very entertaining. On approach one regularly sees ... well, nothing...; visibility is 'zero zero' [1] at 20 feet in dust (close your window prior to starting the approach; you only make that mistake once).You either call the overshoot, which just means you'll have to come around and do it again, or pause (two, three) and mother earth will find you. To the Boeing engineers who did the initial design my hat is off. I think they should get a Nobel for engineering. As a friend put it to me, 'If it ain't Boeing, it's not going.'

"As for the missions here, Chinooks have run the gamut from Ring Route Re-supply to pax [passenger] transfer (longest day was 8.4 hours from start to shutdown carrying a total of approximately 200 pax and several thousand pounds of cargo plus one dog). Loads have been from tri-walls, artillery pieces, vehicles, and generators (single, tandem and triple hook) to everything in between.[2] I have executed just over six planned Operations in both the Canadian sector and with the Brits in Helmand Province.[3] Escort for our Chinook Call Signs on these types of operations has covered the gamut of US [United States] and CDN [Canadian] Attack and Armed Helicopters.

Photo: MCpl Robert Bottrill

"By the way, the bad guys don't like the CH146 Griffon. It's amazing what Dillon Aero mini-guns can do to one's perception of the Griffon. There have been challenges, but none that weren't really expected, and all of us here deal with the same issues. High temp and high DA [density altitude].[4] Griffons have conducted the full spectrum of operations such as RECCE [reconnaissance], overwatch, convoy escort, in-extremis close combat attack, emergency CASEVACs [casualty evacuations], emergency passenger and cargo transport, counter-IED [improvised explosive device], team inserts and extract, and command and liaison. Two of our Griffons came back WINCHESTER [out of ammunition] the other day (our aircraft C/Ss [call sign] are very apropos but not releasable via these means); the enemy had a bad day. The only airframe I want escorting me is our own Griffon.

"From the mental side, this place can be a challenge. The nights before deliberate operations, I don't like. Too much time on one's mind to think about things; i.e. what can go wrong (once you strap in it's not a problem as you are mission/task focused). The first four weeks, speaking for myself, although I'm sure a few others felt the same, were a challenge. First, coming to grips with the machine and the theatre (my appreciation did not take into consideration the three years I have been away from Tactical Aviation Ops), then we lost Jo and Pat in the crash[5] (approximately three years to the date of my crash),[6] then several other Ramp-ceremonies from IEDs to anti-personnel mines, and then one of the MI-8s[7] that is co-located with us crashed 100 metres from the ramp on take-off. It had 21 people on board (16 didn't make it). Three CHF(A) personnel were among the first on the scene. I'm sure you can imagine what scene greeted them and the injuries sustained by those on board. The actions of the three CHF(A) members contributed to saving the lives of the five survivors. We had to overfly the crash site and wreckage for about a week on departure and arrival. An Mi-26[8] based in KAF was shot down in Helmand (crew and aircraft didn't make it). Then an F-15[9] crashed in the north (neither made it), followed by a Tornado[10] here in KAF on take-off (both ejected). Add in the

constant MEDEVAC [medical evacuation] call signs rolling in and out with the injured and the first month was... well, it just was.

"Currently I am into a good rhythm. Total hours flown since late June, 95 and holding steady at around 45 hours for a rolling 30-day calendar. Several flight engineers and door gunners, as well as a couple of 146-pilots are bumping into 85 hours in 30 days mark.... and will fly over 400hrs during their six-month tour."

[Editor's note: The next portion describes one particular Operation which that author provided after the original part of the narrative.]

"Sitting on the ramp spooled up ready to go and trying to contact our overwatch[11] call signs. No Joy [no contact/loss of communication]. Clock ticking (need to hit a certain take-off time or the light and mililux levels will be too low to fly). Finally, 'LIFTER 81, OVERWATCH 92, Primary LZ [landing zone] is Hot, we are returning WINCHESTER to reload.'

"That's not good....So discussion now takes place between us and the Griffon escort call-signs and the commanding officer. Decision: take-off for the alternate LZ after overwatch has reloaded and gets 'eyes on'. Accept the risk of low illum [illumination] on egress.

'LIFTER 81, OVERWATCH 92, I think you're taking RPG fire.... You're taking RPG fire!'

"Seven minutes back, overwatch calls 'Alternate LZ is good.'

Turn in. Run in is good, landing is fine, minimal dust. One–third through offload, 'LIFTER 81, OVERWATCH 92, I think you're taking RPG fire.... You're taking RPG fire!'

"From our brief before the trip I thought the threat would be from another direction. I'm looking out and don't see a thing. No red lights in the cockpit, no noises other than the machine (this all happens in a split second). We're fine. Not sure what he's talking about. The thought in the back of my head is 'And?!?!?!' Nothing I can do. One boot on the ground...all boots on the ground. Like I said, I didn't see anything from my seat at the show, but my flight engineer at the ramp was getting the 4th of July. Fifty-calibre, rockets, hellfire missiles as the overwatch opened up. He didn't mind too much as more was going in than was coming out. He gave the 'hurry up and get the hell out of our helicopter sign' to the rest of the Platoon we were inserting.

"A Griffon joined the fun as we pulled pitch and departed. All I saw were some flashes on departure and the sound of heavy calibre firing over the radios as our overwatch and close protection were engaging and talking.

"The return to base was uneventful. Both overwatch went WINCHESTER again. Extract next morning went smooth. Lots of dust, though, trying to get a copy of the UAV feed. Planning continues for tomorrow and in the words of my Québécois-speaking mates: *C'est un jour de marmotte!*"

CHF(A) Chinooks and Griffons continue their support of multinational operations in Afghanistan, and despite being relative newcomers, are quickly proving that they are capable of conducting missions that match the capabilities of other more experienced nations

in this theatre of operations. Following are some of CHF(A)'s Roto 7 achievement from April to November 2009:

Over 1500 hrs of Chinook and 3500 hrs of Griffon Flying;

Over 15 000 passengers and 1 000 000 pounds of cargo have been transported aboard CHF(A) helicopters;

CHF(A) has participated in over 30 deliberate operations in the most dangerous areas across the Kandahar and Helmand provinces;

CHF(A) has evolved to being tasked by RC(S) (Regional Command South) as the Aviation Lead Task Force, meaning that it has been in charge of planning and was in command of major multi-national air assaults where Canadian Chinooks and Griffons have led British Chinooks and American Kiowa Warriors and Blackhawks for the insert/resupply/overwatch/extract of Canadian, American and British battle groups. CHF(A) has inserted, resupplied, provided armed overwatch, and extracted over 300 troops over a five-day period;

The CH146 Griffon has supported troops in contact over 50 times and has used force on more than 20 occasions to enable ground troops to break contact and to regain the initiative; and

CHF(A) has supported Coalition Forces troops in over 50 different forward operating bases throughout RC(S) including the Kandahar, Helmand, Uruzgan and Zabul provinces.

The Canadian Air Force has built a reputation for sound planning, reliability, and accountability for every job with which it has been tasked. There is no doubt that CHF(A) has contributed to saving the lives of Canadian and Coalition Forces troops on the ground by their support, and by enabling them to minimize the times they have had to drive on the dangerous and unforgiving Afghanistan roads.

Captain Ron Busch, CD
After two years as a reservist, Captain Busch became a Regular Force member in 1984. He reclassified from instrument electrical technician to pilot in 1991. After obtaining his Wings in 1995 he spent 10 years with 427 Tactical Helicopter Squadron in Petawawa, ON, with a two-year tour as 2 CMBG [Canadian mechanized brigade group] G3 Aviation. In 2005, he was posted to 413 Transport and Rescue Squadron flying the Cormorant. In March 2005, Captain Busch was selected as one of the initial cadre of Canadian Chinook pilots to go to Fort Rucker, Alabama, for training. As well as numerous domestic and international operations, Captain Busch is on his fourth overseas mission, having served in Haiti, Bosnia (twice), and Afghanistan. He is a graduate of the Advance Aviation Course & Army Operations Course.

Captain François Lavertu
Captain Lavertu joined the Canadian Forces in June 1996. He is on his second tour of service in Afghanistan and is now flying the CH147 Chinook as a member of ROTO 7. When at home in Canada, Captain Lavertu serves with 430 Tactical Helicopter Squadron in Valcartier, QC.

List of Abbreviations

CASEVAC	casualty evacuation
CDN	Canadian
C/S	call sign
DA	density altitude
DG	door gunner
FE	flight engineer
IED	improvised explosive device
illum	illumination
IR	infrared
KAF	Kandahar Airfield
LZ	landing zone
MEDEVAC	medical evacuation
Ops	operations
Pax	passenger(s)
RC(S)	Regional Command (South)
RECCE	reconnaissance
RPG	rocket propelled grenade
US	United States

Notes

1. "Zero zero" means that the pilot can see nothing horizontally or vertically.

2. The Chinook has a triple hook system that is used to carry, or sling, loads underneath the helicopter. Depending upon the size of the load, up to three hooks may be used to provide increased stability.

3. Helmand is a province in Afghanistan that borders Kandahar province, where the majority of Canadians are located.

4. Air density is the pressure altitude adjusted for non-standard temperature and it is affected by temperature and humidity. An increase in temperature and humidity will result in a decrease in density altitude that translates into reduced lift, a decrease in propeller efficiency and a reduction in engine power.

5. Master Corporal Pat Audet and Corporal Martin Joannette were killed in a CH146 Griffon crash near Kandahar on 6 July 2009.

6. Captain Busch was involved in a crash of a CH149 Cormorant helicopter off the coast of Nova Scotia on 13 July 2006.

7. The Mi-8 helicopter is a medium twin-engine, single-rotor Russian helicopter operated by the Afghan Air Force and private contractor.

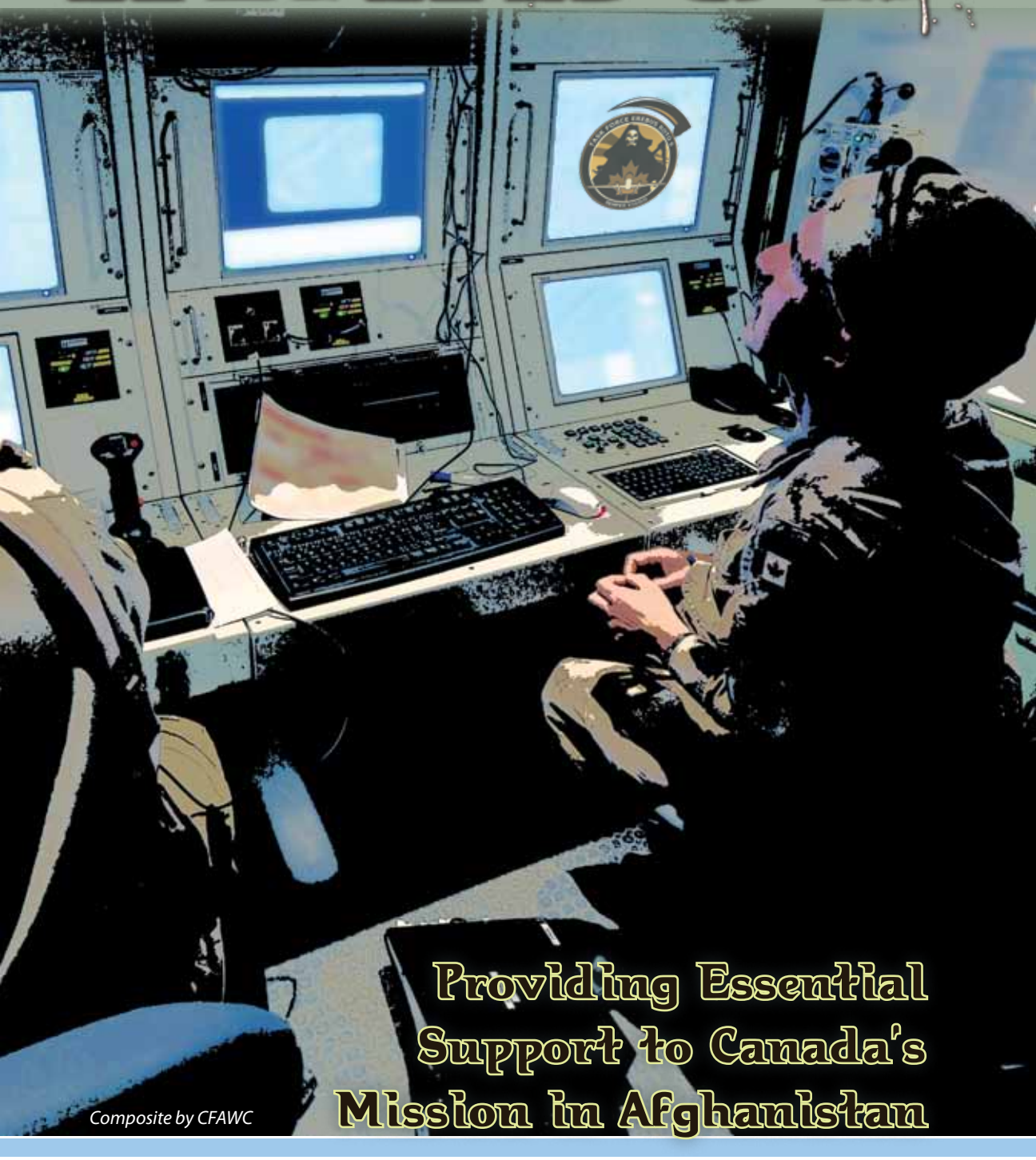
8. The Mi-26 helicopter is a heavy-lift Russian transport helicopter operated by civilian contractors in Afghanistan.

9. The F-15 Eagle is a twin-engine, all-weather fighter operated by the U.S. Air Force. It has a crew of two.

10. The Tornado is a twin-engine jet combat aircraft operated by NATO nations in Afghanistan.

11. A position adopted by an element which allows for a long-range view of the terrain for the purpose of providing security for static or moving forces. From this position the element may guide supported elements through an area while providing early warning of enemy activity and hazards.

TASK FORCE EREBUS



Composite by CFAWC

Providing Essential Support to Canada's Mission in Afghanistan

By Captain Kyle Welsh

Task Force (TF) Erebus, operating the CU170 Heron unmanned aerial system (UAS) out of Kandahar Airfield, has flown thousands of hours in support of Canada's mission in Afghanistan; however, most people are unaware this unit even exists. (In Greek mythology, Erebus was the son of a primordial god, Chaos, and represented the personification of darkness and shadow that filled in all the corners of the world.)[1] The various capabilities that this unit brings to the war effort provide commanders with the vital capacity to conduct intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) operations. In doing so, TF Erebus has greatly improved Canada's ability to accomplish its mission in Afghanistan and has almost certainly saved Canadian, coalition, and Afghan lives.

The first official details about Canada's new UAS capability were announced on August 7, 2008 when the Minister of National Defence, the Honourable Peter MacKay, revealed the government's plan to fulfil the recommendations of the *Independent Panel on Canada's Future Role in Afghanistan*, which is also referred to as the Manley Report. Among several findings in this report was a requirement for high performance unmanned aerial vehicles (UAVs).[2] In accordance with Canada's decision to extend its participation in Afghanistan past 2009, the new UAS project needed to be developed quickly and effectively.

The UAS procurement process took place under the title of The Noctua Project. Latin for "little owl," Noctua presented a number of challenges because the UAS had to meet stringent performance capabilities within the confines of a fixed cost, and it needed to be fully operational in Afghanistan within a year. According to Major Andrew McCorquodale at the Directorate of Air Requirements at National Defence Headquarters in Ottawa, the various staff tasks necessary to procure this UAS capability were conducted at record speed. The project evolved from initial conception to the awarding of the contract in a mere nine months. Major McCorquodale stated that he had "never heard of another fully competitive project that moved this fast."[3]

On August 1, 2008, the Noctua contract was awarded to MacDonald Dettwiler and Associates Ltd. (MDA) of Richmond, B.C. The contract stipulated a two-year lease of the CU170 Heron UAS, at a cost of $95 million.[4] Under this agreement, MDA would

Photo: Cpl Andrew Saunders

be responsible for the conduct of training, maintenance, and logistical support of the Heron, while the Air Force would operate and employ the UAS. Upon signature of this contract, MDA began to focus on the task of certifying Canadian Air Force personnel on the Heron system, with the goal of establishing an operational system in theatre by the end of the year.

The Canadian Heron UAV Detachment (now referred to as TF Erebus) was stood up at Kandahar Airfield in December 2008. By mid-December, the Chief of Defence Staff officially declared the Heron UAS airworthy and ready to support the Afghanistan mission.[5] TF Erebus completed its first flight in Afghanistan on January 1, 2009, carried out its first operational mission on January 9, 2009, achieving initial operational capability (IOC) on January 21, 2009.[6] By declaring IOC, TF Erebus confirmed its capability to provide the commander of Task Force Afghanistan with an airborne, operational-level, ISTAR platform. This project was implemented at an amazing pace, progressing from contract awarding to its first flight in Afghanistan within only five months.

The CU170 Heron has a wingspan of 16.6 metres (54.5 feet), a length of 8.5 metres (28 feet), and a maximum take-off weight of 1150 kilograms (2535 pounds).[7] It is controlled by a line-of-sight data link between the aircraft and an antenna platform called a ground data terminal (GDT). The Heron utilizes an automated take-off and landing (ATOL) system to carry out runway-based take-off and landings. Once airborne, the Heron is operated via a number of different manual or programmed flight modes. While on-station,[8] the Heron utilizes various payloads to gather intelligence data. As the Heron may conduct operations of up to 24 hours and at altitudes of up to 30,000 feet, it is classified as a medium altitude long endurance (MALE) UAS.

TF Erebus is comprised of a diverse team of personnel: air combat sensor officers (ACSOs), pilots, airborne electronic sensor operators (AES Ops), intelligence operators (Int Ops), aerospace telecommunications and information systems technicians (ATIS Techs), supply technicians, a resource management support (RMS) clerk, and various MDA personnel. These individuals come from all across Canada and they typically have little to no experience operating UASs prior to the commencement of their Heron UAS training. Upon receiving confirmation of their deployment, these individuals spend nearly one year completing pre-deployment and Heron UAS training prior to their actual deployment. Once in theatre, TF Erebus personnel are scheduled in a manner that permits 24/7 operations. This scheduling process enables an aircraft to be on-station almost continuously.

UAS operations have their unique characteristics, but the actual flight procedures are similar to that of other aircraft types. There are pre-flight duties, which include mission planning, briefings, and preflight inspections. Once the crew has prepared the aircraft for flight, there is the take-off, in-flight checks, and the mission. Upon completion of the mission, there are approach and landing procedures, post-flight shutdown checks, and finally a post-mission debrief and paperwork. In the process of carrying out these duties, the only real difference between manned and unmanned aircraft is the fact that the crew is not actually within the aircraft, which therefore requires a data-link between the air vehicle and the ground control station (GCS).

A Heron flight crew is typically composed of one air vehicle operator (AVO), one payload operator (PO), and Int Ops. AVOs and POs control the Heron and its sensors from a GCS, while Int Ops exploit the sensor's data from a common ground exploitation suite (CGES). TF Erebus conduct their missions from within the confines of Kandahar Airfield. While operating from within the relative safety "inside the wire," a Heron crew carries out missions that would have previously required the involvement of a number of troops "outside

Photo: MCpl Robert Bottrill

the wire." The result is a force multiplier, able to provide operational commanders with critically important intelligence through the use of the Heron and its sensors.

AVOs are qualified Canadian Forces pilots or ACSOs that have completed contractor-provided AVO qualification training. AVOs are designated as mission commanders. As such, they are not only responsible for flying the Heron, but also for coordination with the supported agencies, for advice to the unit on all flight-related concerns, and for the overall conduct of each mission.

Although there are similarities to operating a manned aircraft, operating an unmanned aircraft presents unique challenges.

Within the GCS, the AVO works directly alongside the (PO). POs are AES Ops that have completed the contractor-provided PO


Photo: MCpl Robert Bottrill

qualification training. Warrant Officer Grant Reid, who deployed with the initial ROTO of TF Erebus, explained:

> The primary job of the payload operator is to be an integral member of the crew. As such, it is not only important to be able to operate, optimize, and report what the sensors detect, but also to assist in mission planning, prepare the vehicle for missions, and be the second check for the AVO in emergencies and during critical phases of flight. The airborne electronic sensor operator (AES Op) was a perfect match for this position. The AES Op trade is filled with qualified aircrew who are typically employed as the primary sensor operator on other CF [Canadian Forces] aircraft.

In addition to the personnel inside the GCS, Int Ops provide the expertise needed to exploit the Heron's sensor data. Int Ops have extensive training in the field of intelligence, and while deployed with TF Erebus are tasked to assist with mission planning, to coordinate with supported agencies, to interpret and analyse data during the mission, and to conduct intelligence functions on behalf of the unit itself.

Warrant Officer (WO) Dennis McNulty has extensive experience analysing imagery and was an ideal candidate to deploy with TF Erebus. Warrant Officer McNulty said:

> During previous wars, the Air Force employed tradesmen called Clerk Intel to provide intelligence to support air operations. These tradesmen analysed the photos taken on photo reconnaissance missions to provide the most up to date tactical intelligence in preparation to an operation. If we fast forward to today, technology has vastly improved the speed at which tactical imagery intelligence is disseminated to operational elements. The sensors onboard the UAV enable us to view digital full motion imagery in real time. This technology has greatly increased the speed with which the commander can be presented intelligence information to make decisions.

As a result of its members' training and expertise, TF Erebus is able to carry out a variety of missions. TF Erebus commonly conducts Intelligence, Surveillance and Reconnaissance (ISR) and overwatch[9] missions in support of Canadian and coalition force units. Although it is not normally tasked as a specific mission, the Heron UAS can also be utilized to assist with the targeting process.

The aim of an ISR mission is the systematic observation of compounds, points, routes, or areas by visual, infrared, synthetic aperture radar, or electronic means.[10] Surveillance is a "go look" mission during which the supported unit specifies an area of interest and the mission lies in assessing the situation in that area. In contrast, reconnaissance is a "go look for" mission where the supported unit specifies specific objects/persons/activities to be found and observed in a specific area. With respect to operations in Afghanistan, the division between surveillance and reconnaissance may be viewed as academic. ISR is usually the dominant term used to describe the mission, with the supported unit describing the requested effect of the mission. ISR tasks typically involve establishing patterns of life, investigating suspicious activity, providing information on route conditions, searching for improvised explosive devices (IEDs) and their emplacement teams, identifying emerging threats, and determining the disposition of insurgents.

Overwatch missions consist of providing ISR-type support to friendly forces, with the added intention of providing an early warning of impediments to movement and potential threats.[11] These missions are often conducted in support of fixed locations, such as forward operating bases (FOBs), combat logistic patrols, mounted or dismounted operations, or specialist teams. A show of presence can also be useful during over-watch missions. A show of presence involves the deliberate exposure of an aircraft with the intent of intimidating hostile forces and discouraging hostile acts.[12] Although normally flown covertly, the Heron can be operated in a manner where it can be seen or heard while remaining outside of enemy weapon engagement zones, thereby deterring insurgents from carrying out their desired activities.

TF Erebus is also able to participate in the targeting process. In accordance with the law of armed conflict (LOAC) and the applicable rules of engagement (ROE), the targeting process may be described as the action taken to engage legitimate military targets. The targeting process, in its most simplistic form, can be broken into three phases: target acquisition, target engagement, and combat assessment. For the Heron, targeting may be assigned as a stand alone mission, but it is commonly a task that develops during a mission. Target acquisition is the detection, identification, and location of a target in sufficient detail to permit the effective employment of weapons.[13] If suspicious activity is detected during a mission, the Heron crew will inform the appropriate agencies of the situation. Upon positive identification of a legitimate military target, the supported agencies and higher headquarters staff will determine a legitimate course of action. Although the Heron does not carry weapons, its crew may be tasked to assist with the target engagement. Target engagement is action taken against a hostile force with intent to deter, damage, capture, destroy, suppress, or neutralize the force.[14] Upon completion of an engagement, a combat assessment is conducted in order to carry out a battle damage assessment, a munitions effectiveness assessment, and to decide upon future targeting or re-attack recommendations.[15] Even if the commanders decide against engaging a target, TF Erebus can still be employed to provide additional intelligence data about the situation.

The phrase "information is power" holds true in modern warfare, and TF Erebus is able to provide an abundance of information. With its extensive range and endurance, as well as its impressive array of sensors, the Heron can effectively cover Canada's area of responsibility and provide critical information as required. The information gathered by TF Erebus is vital

to the conduct of operational missions, and as a result, the Heron is continually in high demand.

Colonel Coates, the initial Commander of the Joint Task Force Afghanistan Air Wing, saw the immediate benefits of employing the Heron UASs.

Shortly after the Canadian Heron arrived in Afghanistan, an interest developed in a particular compound that posed a rather significant threat to Canadian operations. Due to the stringent regulations in place to prevent civilian casualties, there was a requirement to maintain uninterrupted observation on the compound for an extended period prior to any action being taken. The Heron was still unproven to a very large degree, but at the same time there was going to be no choice except to depend on the Heron to provide a large portion of the coverage. At the appointed time the Heron rolled into position and maintained unblinking observation for a long, critical period. While the Heron was still maintaining its observation, a response was carried out on the compound, all to a very successful conclusion. This action would not have been possible without the Heron, and all of a sudden the importance and flexibility of this new capability became apparent to all those involved. There was lots of positive feedback that day, not only for what the Heron did, but for the real changes that the Heron would bring to future Canadian operations.

Even though UASs are a relatively new addition to the battlefield, their capabilities have already resulted in changes to air warfare doctrine. In particular, the Heron's long endurance and "unblinking eye" shatters the previous negative air power characteristic of limited persistence. "UAVs are vital for these two reasons—persistence and immediate effects," explained Colonel Coates. "UAVs can look for so long that they increase the chance of detecting threats and they provide near instantaneous, or what we call 'real-time' imagery. Traditional sensor platforms would not provide results for hours or even days after they completed their observation. UAVs provide information that is fresh, which makes it imminently usable."

TF Erebus has significantly improved the Canadian Forces' mission effectiveness and has provided increased protection of their personnel and equipment. As Colonel Coates recalled:

> The Heron and its operators provide critical information that allows our helicopter crews and our soldiers to plan and conduct their missions. That information allows the crews and soldiers to assess security or risks before they arrive or encounter problems. As the senior airman in theatre I am convinced that the information from the Heron, and other high performance UAVs significantly reduced the risk during aviation operations, probably saving lives and preventing the loss of valuable helicopters. Army commanders expressed the same thing to me—that the Heron's information was making their operations safer. Their reactions left me convinced that they believed, like I did, that the Heron was saving lives.

Current and past UAS operations have been critical to informing future UAS plans in the CF. The days of treating these systems more akin to remote controlled model aircraft, rather than operational aircraft fleet, have passed. The CF places a premium on maintaining a core cadre of skilled UAS operators and capturing lessons learned so as to maximize the potential of UASs and prevent attrition. This is now accomplished by capitalizing on our wealth of experience with other aircraft fleets, treating the Heron just as they would any other fleet, subject to the same standards and processes. The proof of Canada's effectiveness and high standing within the world of UAS operations is that other nations are now looking to capitalize on our experience when contracting, training, and carrying out operational employment for their own UAS fleets.

High performance UASs are proving their merit every day in Afghanistan, and the CF is a leader in taking advantage of the capabilities provided by these systems. Although the Heron UAS has been in theatre for only a short time, TF Erebus has proven itself to be a critical asset to the war effort in Afghanistan. The expertise of TF Erebus, coupled with the effective employment of the Heron UAS, has greatly improved Canada's overall combat effectiveness, resulting in the enhanced force protection and the saving of Canadian, coalition, and Afghan lives. ■

Captain Kyle Welsh is currently deployed on his second tour with Task Force Erebus. Captain Welsh deployed with the initial TF Erebus ROTO as an AVO and the unit's flight safety officer, and he is currently deployed as an AVO and the unit's standards and training AVO. At the time of publishing, Captain Welsh had logged approximately 800 hours and flown over 200 missions with the Heron UAS in Afghanistan.

Submissions (in order of appearance in the article):

Warrant Officer Grant Reid has served the Canadian Forces in excess of 25 years and has completed in excess of 8 Operational Deployments. An Airborne Electronic Sensor Operator for the past 10 years, he is currently posted to 1 Cdn Air Division HQ (Det Greenwood) and is the UAV Standards and Evaluation Team Payload Operator.

Warrant Officer Dennis McNulty was the tactical motion imagery instructor for the imagery school at the CF Joint Imagery Centre in Ottawa, ON. Currently he is serving on ROTO-9 as the intelligence team lead with the Task Force Erebus, known as the Canadian (Cdn) Heron UAV Detachment at Kandahar Airfield, Afghanistan.

Colonel Christopher Coates, O.M.M., M.S.M., CD is Commander of 1 Wing, with its Headquarters in Kingston. He has flown tactical helicopters in reconnaissance, utility, and special operations roles and has commanded at flight, squadron, and wing levels. The first commander of Joint Task Force-Afghanistan Air Wing, he is a graduate of the University of Calgary (BSc Chemistry and Biochemistry), Canadian Land Force Command and Staff College, Institut Royal Supérieur de la Défence in Brussels, Belgium, and the USAF Air War College (Masters of Strategic Studies).

List of Abbreviations

AES Ops	airborne electronic sensor operators
ATIS Techs	aerospace telecommunications and information systems technicians
ATOL	automated take-off and landing
AVO	air vehicle operator
Cdn	Canadian
CGES	common ground exploitation suite
FMV	full motion video
FOB	forward operating base
GCS	ground control station
GDT	ground data terminal
IA	imagery analysts
IED	improvised explosive devices
Int Ops	intelligence operators
IOC	initial operational capability
ISR	intelligence, surveillance and reconnaissance
ISTAR	intelligence, surveillance, target acquisition, and reconnaissance
LOAC	law of armed conflict
MALE	medium altitude long endurance UAS
MDA	MacDonald Dettwiler and Associates Ltd
PO	payload operator
POL	pattern of life
RMS	resource management support
ROE	rules of engagement
TF	task force
UAS	unmanned aerial system
UAV	unmanned aerial vehicle

Notes

1. "Erebus," *Wikipedia.org.* Available on-line at http://en.wikipedia.org/wiki/Erebus (accessed: January 15, 2010).

2. Of note, the terms UAV and UAS are often used interchangeably; however, the term UAS comprises the whole system (air vehicle and ground control station), while UAV refers to the aircraft itself.

3. David Krayden. "Heron project spooled up quickly." *Canada's Air Force, Air Force News*. Available online at http://www.airforce.forces.gc.ca/v2/nr-sp/index-eng.asp?id=7030 (accessed February 10, 2010).

4. Ibid.

5. Holly Bridges. "Helicopters leave for Afghanistan." *Canada's Air Force, Air Force News.* Available online at http://www.airforce.forces.gc.ca/v2/nr-sp/index-eng.asp?id=7552 (accessed February 10, 2010).

6. Dean Menard. "CU170 Heron unmanned aerial vehicle ready to go to work." *Canada's Air Force, Air Force News*. Available online at http://www.airforce.forces.gc.ca/v2/nr-sp/index-eng.asp?id=7770 (accessed February 10, 2010).

7. Canadian Department of National Defence, "CU170 Heron." *Canada's Air Force. Operations in Afghanistan*. Available online at http://www.airforce.forces.gc.ca/vital/v2/docs/jtfa-foia/cu-170-heron-eng.pdf (accessed February 10, 2010).

8. The time during which an aircraft can remain in its target or search area. It may be determined by endurance or by order.

9. A position adopted by an element which allows for a long-range view of the terrain for the purpose of providing security for static or moving forces. From this position, the element may guide supported elements through an area while providing early warning of enemy activity and hazards.

10. Canadian Air Force, *Heron Unmanned Aircraft System Standard Manoeuvre Manual.* (Winnipeg: 2009).

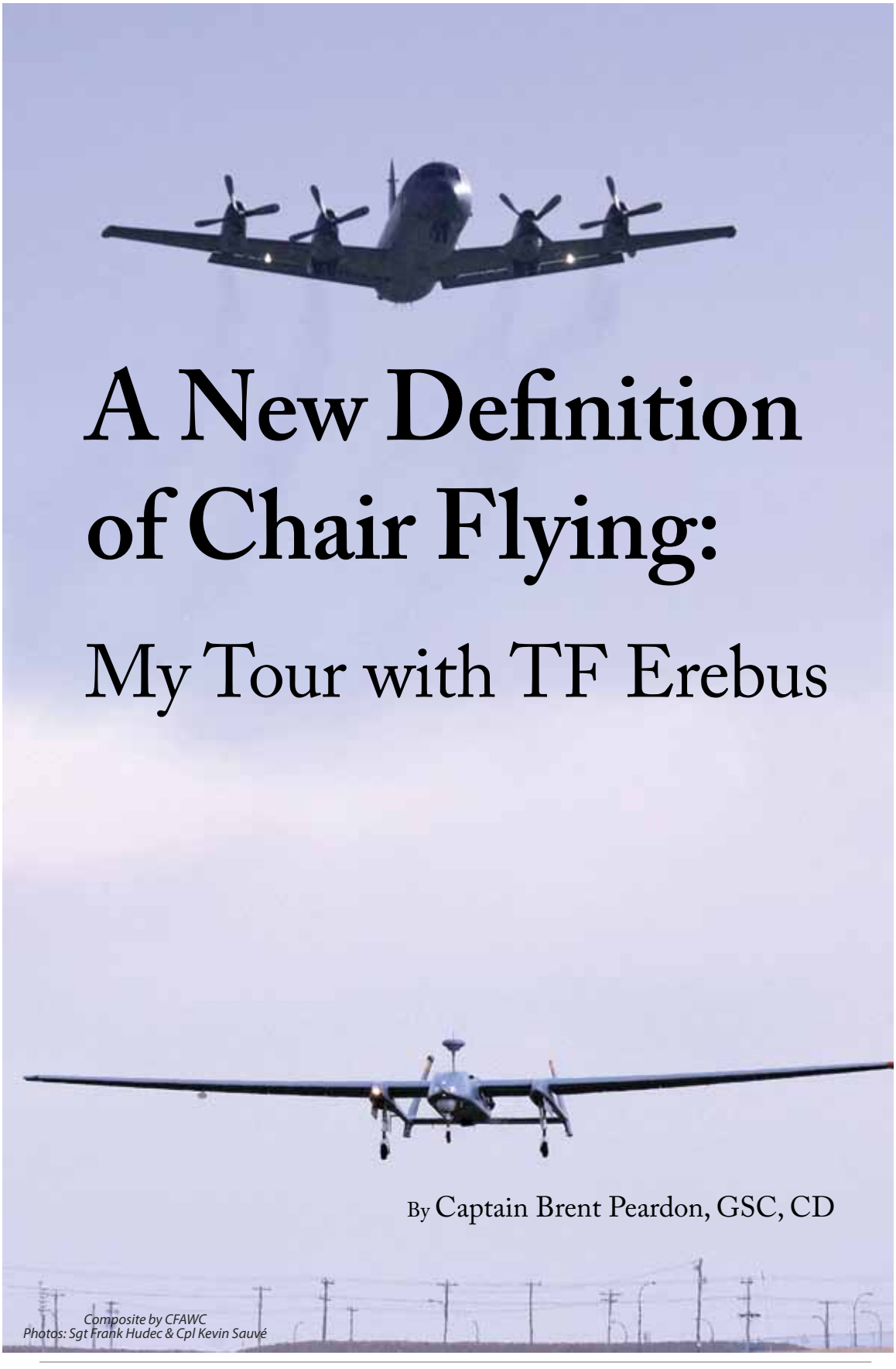
11. Ibid.

12. Ibid.

13. Ibid.

14. Ibid.

15. Ibid. .



A New Definition of Chair Flying:

My Tour with TF Erebus

By Captain Brent Peardon, GSC, CD

Composite by CFAWC
Photos: Sgt Frank Hudec & Cpl Kevin Sauvé

From January to August 2009, I completed an eight month tour with the Canadian Heron UAV Detachment (now TF Erebus) based at Kandahar Airfield, Afghanistan. The experience was both challenging and rewarding. I was able to glean much experience from the tour which will serve to aid me in the future, particularly in the tactical areas of intelligence, surveillance and reconnaissance (ISR) and overland operations. On an aviation note, I also gained experience in managing automation and maintaining situational awareness (SA) while operating in a complex, rapidly changing airspace environment.

In March 2008, while serving as a CP140 Aurora first officer at 405 Long Range Patrol Squadron, I was informed that several qualified pilot volunteers were being sought for an unmanned aerial vehicle tour in Kandahar. I had been serving with 405 Squadron for just under a year and a half, and was in the process of upgrading to aircraft commander. I had already been introduced to the CP140's new overland ISR role, having completed exercises in Wainwright, Alberta, and El Paso, Texas, and found the missions quite rewarding. Thus, when the opportunity arose to serve with a newly-formed UAV detachment in Kandahar, I eagerly volunteered for a variety of reasons.

On a career note, I felt that the opportunity to gain an extensive amount of overland ISR experience in an operational theatre was quite desirable, as it would significantly aid my ability to contribute to 405 Squadron and to the long range patrol community after the tour. As well, we would be serving as the first operational Canadian CU170 Heron crews, thereby drafting new tactics, techniques and procedures that would fittingly employ the new airframe — something that struck me as a daunting yet very beneficial experience for future career endeavours.

In addition, even the technology interested me; as a flight simulator enthusiast, I was quite curious about what the Heron system would be like to operate. On a more personal note, several of my friends and colleagues serving in different Canadian Forces (CF) elements

Photo: Cpl Andrew Saunders

had already completed at least one tour in Afghanistan, and I was eager to do the same in my own capacity. I felt a personal obligation to aid in the mission. Thus, when the opportunity arose to support Canadian troops by carrying out airborne surveillance, increasing situational awareness of the battlefield, and providing a heightened sense of security to our ground forces while they were conducting operations, I was more than happy to volunteer.

From a pilot's perspective, I quickly discovered various similarities between flying a manned aircraft and carrying out my duties as an air vehicle operator (AVO). There were several AVO tasks that were facilitated by my previous experience as a pilot. For example, both professions rely heavily on thorough situational awareness of one's operating airspace at any given time. The airspace in Afghanistan is busy and very complex, and updates are passed via secure and unsecure radios very frequently. As an AVO, one must maintain airspace awareness at all times, and always use clear, concise radio transmissions, precisely the same as one would be expected to do while flying a manned aircraft.

In addition to airspace awareness and radio procedures, tactical awareness of the battlefield is another area in which the AVO and pilot professions are mutually inclusive. Our control stations were able to help us greatly in depicting visual representations of events taking place on the battlefield, just as a moving map display and proper cockpit resource management will enable the pilot of a manned aircraft to retain complete battlefield awareness while flying on a tasking.

While flying operationally, an AVO may be expected to extend to maximum crew duty day, fly at irregular hours, and deal with fatigue and circadian rhythm interruptions, much as any other operational aircrew. I had already experienced fatigue management while conducting aircrew duties as an Aurora pilot; hence, I was already aware of my own fatigue limitations, and warning signs thereof, before taking on duties as an AVO.

An additional area in which the two professions correlate is the proper use of automation. As aircraft systems become more advanced, a pilot must learn how to use automation as a workload reduction tool while still understanding when to "shed layers" of automation and step in manually. Operating a UAV platform is similar, with the exception that on many unmanned systems, an AVO can only shed so many layers before safety of flight becomes an issue. For example, on the Heron, I discovered that flying manually in "sticks" mode was an emergency procedure only to be conducted when one or more of the autopilot control loops was beginning to fail.

Further to the issue of automation is that of the old programmer's adage of "garbage in, garbage out." Just as a fatigued pilot can unknowingly program in the wrong approach and place the aircraft in an unsafe regime of flight if the error is not trapped, the same holds true for an AVO. Although the AVO will be unharmed, the UAV and surrounding environment may be placed in severe danger if routes and waypoints are improperly entered. I discovered that this automation issue begins to differ from manned flight in the area of "return home" routes. Unmanned aerial vehicles are generally prepared to fly a pre-programmed route, entered by the AVO, in the case of an unrecoverable loss of link with the controlling station. On a manned aircraft the pilot may take action manually to prevent an incorrect programming action to continue; however, I learned during AVO training that a UAV that has lost link will follow its "return home" instructions to the very last digit until link is re-established. It quickly became very apparent to me that one omitted zero on a waypoint altitude assignment could cause a lost-link UAV to simply fly into a hilltop at cruising speed and destroy itself. Our solution for this risk was similar to the crew of a manned aircraft — check, re-check, and ask fellow crewmembers to check as well. In this way, any errors were trapped before an incident could occur.

While I was able to draw upon my experience as a pilot to assist me in becoming a

Photo: MCpl Robert Bottrill

proficient AVO, I discovered that some areas of the job were completely different from anything else I have ever done as an aviator. For instance, the endurance of the Heron is such that several mission commanders may be in command of the UAV at various times during a sortie. I quickly discovered that airborne "handovers," while similar to airborne "seat swaps" on the Aurora, held a unique significance in that complete command of the aircraft AND the mission was handed over to the next AVO. Clear communication and thorough handover procedures were crucial, as the previous AVO may have been at the end of a shift and only available for clarification for the next thirty minutes or so after the handover. I discovered that keeping an accurate mission log of what had occurred during the shift helped greatly. On a manned aircraft, it is common to have another crewmember maintain the mission log. On the Heron, the basic flight tasks were so well automated that I and the other AVOs were able to keep our own mission logs while closely monitoring the aircraft systems without any negative effects.

In addition, the Heron ground control station itself was unlike any other cockpit I had operated to date. Over time, I admitted to myself that operating an aircraft from a desk console had a few definite advantages. The physical act of operating the control surfaces, the "hands-and-feet" of flying, were highly automated and simplified, enabling the AVO to divide concentration effectively to other areas. Also, the AVO and other crew were not exposed to the noise, vibration, turbulence, manoeuvres, and temperature changes of manned tactical flight. In my experience, this resulted in decreased crew fatigue and an enhanced ability to perform other tasks such as taking mission notes and monitoring communications equipment. However, the "one-G, zero-knots" desk console came at a price in the form of decreased SA in several senses. Visually, I found that the system was an excellent tool for positional awareness and battlespace management; however, the AVO could not use any additional senses to monitor the UAV. For the first time, I could not make decisions by way of listening for any change in the engine note, feeling

Photo: MCpl Robert Bottrill

any turbulence that could necessitate an area change, or smelling any smoke that could warn of an impending system failure. Any changes in the state of the UAV or the atmospheric conditions needed to be acquired visually by way of the instruments and telemetry, the warning systems, and a thorough scan procedure using various cameras mounted on the platform. Fortunately, a regular instrument cross-check procedure is instilled in every winged pilot, and I found that this cross-check helped greatly.

In closing, I found that serving with the Canadian Heron UAV Detachment was a demanding yet rewarding experience that was unlike any other aviation job I had previously encountered. I was grateful to be able to provide an invaluable service to our troops and do my part for the mission in Afghanistan. On a personal note, I am pleased that I gained a much greater familiarity with overland ISR and the use of automation as a whole, which will significantly benefit my future aviation duties with the long range patrol community. ■

Captain (Capt) Brent Peardon was born in Charlottetown, Prince Edward Island. Capt Peardon enrolled in the Canadian Forces in June 1997, completed a Bachelor of Arts (Honours English) degree from the Royal Military College of Canada in 2001, and was awarded his pilot wings in November 2004. Capt Peardon is currently serving with 405 Long Range Patrol Squadron in Greenwood, Nova Scotia.

List of Abbreviations

AVO	air vehicle operator
capt	captain
ISR	intelligence, surveillance and reconnaissance
SA	situational awareness
UAV	unmanned aerial vehicle

8 AMS IN SOUTHWEST ASIA

By Lieutenant-Colonel Art Agnew, CD

Photo: MCpl Bruno Turcotte

The day after the terrorist attack of September the 11th the United Nations Security Council issued resolution 1368, setting in motion an international effort that resulted in Canadian troops deploying to Afghanistan. One hundred personnel were initially authorized to deploy on September 20th and on October 8th. Operation Apollo was launched with over 2000 Canadian Forces (CF) members involved.[1] The Canadian Forces involvement in Afghanistan was immediate and decisive.

The 8 Air Maintenance Squadron (AMS) personnel first deployed on January 15, 2002 for what was thought to be a relatively short deployment; now, eight years later, maintainers from 8 AMS, augmented by 435 Squadron and 413 Squadron (Sqn), have been deployed continuously as part of the theatre Tactical Airlift Unit (TAU). This article examines that participation and the experience of maintenance and operations in terms of effectiveness and efficiency, and discusses the influence of this operation on the relationship between operations and maintenance in the air mobility community.

For the aeronautical engineering (AERE) occupation and 500-series trades there have been many debates over the years regarding squadron versus central maintenance and whether they are considered support versus operations. This has been ongoing in Canada since a mechanical engineer designed and flew the Silver Dart in Baddeck, Nova Scotia, in 1909. At that time the AERE officer was the pilot so the debate was fairly simple. Somewhere along the way it got more complicated. In 1937, aircrew were trained to service Royal Air Force designed radios, and in 1939, Harvard aircraft were maintained by specially trained technicians who worked as part of the squadron. Later, the Station Technical Flight was formed, which morphed into the Base Aircraft Maintenance and Engineering Organization. In 1993, as part of the move to align the Air Force Command and Control Information System, 8 AMS was formed as an element of 8 Wing Trenton.

The debate between squadron maintenance and centralized maintenance is moot. Really, the question is whether maintainers are an integral part of air operations or a support trade. Our experience in a theatre of operations over the last eight years leads to the conclusion that being considered an integral part of operations is perhaps the most important element of success and operational excellence for the Air Force.

Of course the operative question is—so what? Air mobility has moved fluidly between squadron-based and centralized maintenance and there are good reasons for both. In 2007, 1 Canadian Air Division Project Management Office Airlift Capability Project - Tactical (Cdn Air Div, PMO ACP(T)) J model and 8 AMS assembled at a retreat to discuss options for maintenance at 8 Wing. Eight courses of action were considered—everything from completely centralized to completely squadron based. That analysis demonstrated that both extremes were inefficient and ineffective and that a combination of the two was actually preferred. The Commander (CO) 1 Cdn Air Div approved the implementation of squadron maintenance in Trenton with a strong second line capability resident in 8 AMS.

Still, in 2010, on the verge of conversion to squadron based first-line maintenance, 8 AMS is delivering superior levels of availability despite the age of the fleet, the budgetary limitations, and the monolithic and highly centralized maintenance model. In fact, during the height of the recent Haiti relief air bridge operation, 8 Wing was supporting up to eight lines of tasking, continuing to fly search and rescue missions, training crews for Camp Mirage rotations, and flying the relief air bridge. The reason this works is that 8 AMS itself, A3, and the operational squadrons in Trenton believe that 500 series technicians and AERE officers are integral to the flying operation.

Strategic Overview

Southwest Asia represents the greatest Canadian commitment to combat operations since the Korean War.[2] Air mobility's commitment to eight years of tactical airlift operations has been no less significant. In fact, it could be argued that it was this demonstration of the benefits of airlift that resulted in the subsequent procurement of C17s, J model Hercs, and Chinooks. These aircraft represent three very significant elements of a powerful airlift combination, all of which were procured and fielded in record time. Previous administrations had been reluctant to approve additional airlift procurements:

> On March 18, 2002, in a television interview on CBC [Canadian Broadcasting Corporation], Prime Minister Jean Chretien questioned why aircraft could not be rented when needed. He said it didn't make sense for Canada to spend a large amount of money on the planes since they would not be required on a full-time basis. This started the change in planning. In the Pugliese article, the Vice Chief of the Defence Staff, LGen [Lieutenant-General] George MacDonald said Defence Minister John McCallum had made it clear that the military could not afford an outright purchase of transport aircraft. At the November 2002 NATO [North Atlantic Treaty Organization] summit in Prague it was reported the Canadian military had shelved its plan to buy the C-17 and would rely instead on a proposed NATO scheme to create a pool of shared strategic-lift aircraft.[3]

It may be a coincidence that after a couple of years of clear evidence of the need for transport aircraft, the liberal government embarked on a procurement strategy that the conservative government has been happy to continue with. The resulting renaissance of the Air Force from the "decade of darkness" has been spectacular and in no small part due to the outstanding contribution of the TAU detachment (det) to the main effort in Afghanistan.

If we accept for a moment that air mobility's contribution to Afghanistan saved the Air Force, and that the TAU det's three aircraft provided the backbone for that effort, how

Photo: Cpl John Bradley

do we account for the huge impact of three "Classic"[4] Hercules aircraft flying in theatre? It is clear that the outstanding skill and daring of the operators made a difference, as Canadian Hercules crews garnered a reputation for accomplishing missions that other nations were unable or unwilling to do; but, we also have to consider the availability of the aircraft and the confidence of the aircrew in the aircraft's ability to fly these missions. These conclusions are backed up by the comments of then Chief of the Air Staff Lieutenant-General Lucas to the Standing Committee on National Defence on the November 26, 2006:

> In conclusion, I would like to reinforce that without the air bridge—the lifeline from our bases in Canada to Camp Mirage, and on into Kandahar and Kabul—the mission could not succeed. The invaluable missions being performed by the men and women of the Air Force in-theatre are integral to the conduct of Canadian Forces operations in Afghanistan. I can assure you, that you can be very proud of what they are doing, on behalf of this country and all Canadians, under dangerous and difficult conditions.[5]

TAU Maintenance Detachment Camp Mirage

The TAU is part of the theatre support element in Camp Mirage. The theatre support element is commanded by a lieutenant-colonel aircrew operating as the commandant of Camp Mirage. The camp provides support for personnel and logistics elements moving into and out of Afghanistan, and has a unique relationship to the host nation. The TAU is commanded by a major aircrew and has a maintenance flight run by a senior AERE Captain. The responsibility for manning this position is shared between 435 and 413 Sqns, and 8 AMS on a six-month rotational basis. It is considered a key developmental position which is highly sought after by maintenance officers and carefully staffed by the CO of 8 AMS.

As indicated earlier, the TAU functions as a deployed squadron. Personnel are rotated in and out based on a somewhat complex rotation

schedule that has evolved over time. Rotations are complex because these squadrons were never designed to support continuously deployed forces. Maintainers from 8 AMS, 435 and 413 Sqns deploy in two groups: a headquarters element that provides leadership and administrative support to maintenance operations who are deployed for periods of six months; and three crews of maintainers who deploy for three 56-day rotations—56 days in, 56 days out, and so on until each person accumulates six months of deployment. Sqn 435 has provided one full crew, and Sqn 413 has provided three persons full-time, and the remainder have come from 8 AMS. Some members have done over eleven 56-day rotations in theatre.

This arrangement has its challenges, as might be expected from a group of people who are put together in a high pressure critical operation. There is no road to high readiness, no confirmation exercise. Maintainers arrive in theatre one day and start fixing aircraft almost literally the next. Leadership changes every six months and each successive team of a warrant officer and captain comes from different squadrons from across Canada. Add to this the fact that the three crews are changing on a rotational basis so that a change is happening roughly every 20 days and you have an extreme challenge. Yet, despite this exceedingly difficult structural leadership challenge, it works, and works well.

As the Air Mobility Fleet Senior Aircraft Maintenance Manager, the CO of 8 AMS is responsible to the commander for the quality of the maintenance in the fleet. Faced with the challenges mentioned above, it was decided to start carrying out Aircraft Maintenance Standardization and Evaluation Audits annually in 2009. Previous to that, the increasingly operational outlook of maintainers and the improving understanding of maintenance of 8 Wing operators was evident; but, the fundamental reasons for this change were not clear. There was some conjecture as to whether these changes were driven by personality or experience, but there was no real proof of either. Furthermore, there was still the mystery of how the TAU det actually worked.

It is beyond the scope of this paper to propose a definitive proof of what is happening in this dynamic. Still, with regards to the question of how technicians and aircrew can be thrown into a theatre of operations with no true road to high readiness and operate at peak levels, two answers seem most likely: experience and training. Experience speaks to decades of deployments around the world, including such missions as evacuations in Africa and countless boxtop missions to resupply Alert. Despite the recent influx of young persons, there are enough old salts left to provide that basis of air mobility know-how. Of course, that only gets you so far, and as mentioned, there are a lot of newly minted technicians filling the ranks of units across the Air Force. Training has greatly improved in the air maintenance community. After the frenzy of the 1990s—amalgamating 13 aircraft trades into three—the maintenance community began dealing with its training program in earnest. At first, the goal was simply to address the trade restructure itself, and then, with a greater sense of urgency, to address the demographical bulge that other trades and classifications are currently wrestling with. The result is that a recruit can be qualified to work on aircraft in less than three years, compared with up to five years before.

That is not to say there are no problems integrating crews, maintenance and aircrew. At one time or another tempers have flared, and morale has flagged, but, ultimately, the mission has come first, and the shared adversity has made for improved understanding. Incidents like what happened to then Corporal Even Jacques, now Master Corporal Jacques, working in 426 Squadron as a maintenance instructor are illustrative. Going into a remote airfield, a Hercules blew a tire. Ground forces of another country were providing security while the flight engineer and maintainer were changing the tire. The aircraft had become mired in the loose dirt, and the altitude was very high, making it hard to hump the dirt and tires around. Suffice it to say that changing the tire was in and of

itself a challenge. The local population was not friendly, sporting AK 47s and chanting "death to Canada" as they approached the aircraft. The security forces had left the plane, and the crew was left to defend themselves, so, with a couple of C-7s, the tire was changed in record time and the aircraft took off without further incident. This type of adventure builds bridges of understanding and bonds of trust that last a lifetime.

Impact on Operations in 8 Wing

As part of the government's overall strategic review, the Canadian Forces Aerospace Warfare Centre is providing their expert advice. 8 AMS was asked to provide statistical evidence that a continuous improvement program exists. An analysis of daily statistics for a five-year period starting in 2005 determined that there has been a continuous and marked increase in operational effectiveness. Each year the numbers of aircraft available have increased significantly; the number of operational restrictions has dropped to virtually zero; and mission accomplishment rate is now above 96 per cent. In addition, the numbers of lost missions due to miscommunications between operations and maintenance has also dropped to near zero. Of course, it is tempting to conclude that the current CO and his rugged demeanour are responsible; but, certainly, one of the primary reasons for the improvements is the prolonged exposure between operations and maintenance for aircrew and ground crew. What makes the difference is that the mission matters, and that maintainers can relate to the mission's importance.

Photo: Cpl Frieda Van Putten

On the operations side, there has been recognition of the important contribution of maintainers and how maintenance impacts mission success. By way of example, the need for technicians to gain proficiency and currency in their trade skills has been firmly entrenched. For two years now, operations have been virtually shut down in Trenton to accommodate a full training week, during which over 80 per cent of the squadron receives special lectures, administrative training, leadership, and mandated training. Further, the focus of generating aircraft has shifted from maximizing sheer numbers of aircraft towards producing sufficient aircraft to meet the planned flying schedule, and then ensuring one or two spares to make certain planned missions fly. Then priority is given to fixing operational restrictions, minors, conducting technician training, and physical training. The result is a shift in culture towards ensuring that each and every planned mission is executed, and then training needs are considered. Each repair has two estimates, one with training and one without. On most occasions, junior personnel are brought along to garner experience from difficult or complex snags. The overall result has been a significant reduction in the maintenance man-hours to maintain the aircraft.

Fallout of Not Being Integral to the Operation

The Berlin Airlift just after the Second World War (WWII) was arguably the first strategic use of an air bridge to achieve a strategic victory. Indeed, it is widely credited with preventing a war with the Soviet Union.[6] As such it also represented the intent of senior Air Force officials to firmly establish air power as a true strategic capability that had to function as a separate branch of the military. From this you can imagine that the success or failure of this airlift operation was of the highest priority.

Initially, the Berlin Airlift did not go well. Procedures were poorly developed; air traffic control was in its infancy; the aircraft were not suited to this type of operation; the Russians were not cooperating; and it was post-WWII Germany, so the infrastructure was in poor shape. Also, of course, the German weather rarely cooperated. Commander General Curtis Lemay brought in General "Tonnage" Turner to sort things out. He had gained his experience

during the Burma airlift over "the Hump" of WWII. Soon after taking command, General Turner underwent "Black Friday", during which he experienced a crash and other difficulties, which led him to record the day as the low ebb of the entire operation.

Undaunted, he immediately set about creating perhaps the best example of an airlift operation in history. It has been described as a conveyor belt of aircraft. He fixed the operations by replacing inefficient aircraft. He employed German girls to bring coffee and refreshments to the aircraft rather than having crews take their breaks off the flight-line, thereby ensuring reduced turnaround time. He developed better air traffic control and flight profiles to reduce the safety distances between aircraft. Finally, and most importantly, he took pains to entrench maintenance and reconditioning as a vital part of the airlift's effectiveness. This is a lesson from history that has been highlighted time and again from our own experience in theatre.

Conclusion

The experience of providing airlift support to the Afghanistan theatre of operations has been extremely important for the modern Air Force. Indeed, it can legitimately be said that it has saved the Air Force—leading to a significant recapitalization of air transport assets. As air mobility has had a formative impact on the operation in theatre and the Air Force in general, so too has the TAU operation affected operations, perceptions, and execution of maintenance in 8 Wing. I think that we have relearned the lessons of history as exemplified in the Berlin Airlift.

Operation and maintenance must be as one for us to achieve our common operational objectives. The leadership of the Air Force has not always considered maintenance to be part of operations, and the results generally speak for themselves. The achievements in 8 Wing after operators and maintainers have shared hard won lessons in battle demonstrate the effectiveness of mutual respect and trust. The work done to integrate technical crewmembers into the new fleets and to use maintenance non-commissioned members and officers in key operational roles must be continued to keep those bonds fresh, as a new generation of operators and maintainers take over the mantle of operational excellence. ■

Lieutenant-Colonel Art Agnew is an Aeronautical Engineer with a degree in Mechanical Engineering from the Royal Military College, Kingston. Over the course of his career he has worked on CF116, CF188, CT114, CT142, CC130, CT133, CU167 and CU161 aircraft. He is currently the CO of 8 Air Maintenance Squadron, 8 Wing Trenton, which he describes as "the best darn squadron in the Air Force."

List of Abbreviations

AERE	aeronautical engineering	Div	division
AMS	air maintenance squadron	PMO	project management office
CBC	Canadian Broadcasting Corporation	Sqn	squadron
Cdn	Canadian	TAU	tactical air unit
CO	commanding officer	WWII	Second World War
det	detachment		

Notes

1. Available online at: http://www.cefcom-comfec.forces.gc.ca/pa-ap/nr-sp/doc-eng.asp?id=490 (accessed February 18, 2010).

2. *CF in Afghanistan, Report of the Standing Committee on National Defence*, Rick Casson, MP Chair, Dated June 2007. Available online at: http://www.afghanistan.gc.ca/canada-afghanistan/assets/pdfs/scond_e.pdf (accessed February 18, 2010).

3. *Strategic Air and Sea Lift for the Canadian Forces*, Paper by the Royal United Services Institute of Nova Scotia, Halifax, Nova Scotia, April 2003. Available online at: http://www.rusi.ca/STRATEGIC%20AIR%20AND%20SEA%20LIFT.pdf (accessed February 18, 2010).

4. WSM AEO Derek Black quote from the Aircraft Maintenance Operators Symposium 27 Jan 10, The Aircraft Engineering Officer marks the transition from the term Legacy Hercules fleet referring to the E and H models, to Classic with acknowledgement to the term coined by Coca Cola™.

5. Transcript of briefing to SCOND committee 26 Nov 2006 by CAS Lucas. Available online at: http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=2528863&Language=E&Mode=1#Int-1790177 (accessed February 18, 2010).

6. Available online at: http://www.trumanlibrary.org/whistlestop/study_collections/berlin_airlift/ (accessed February 18, 2010).

Photo: Cpl Henry Wall

Photo: Sgt Roxanne Clowe

CC177 Operations in Afghanistan

By Captain Simon Potvin

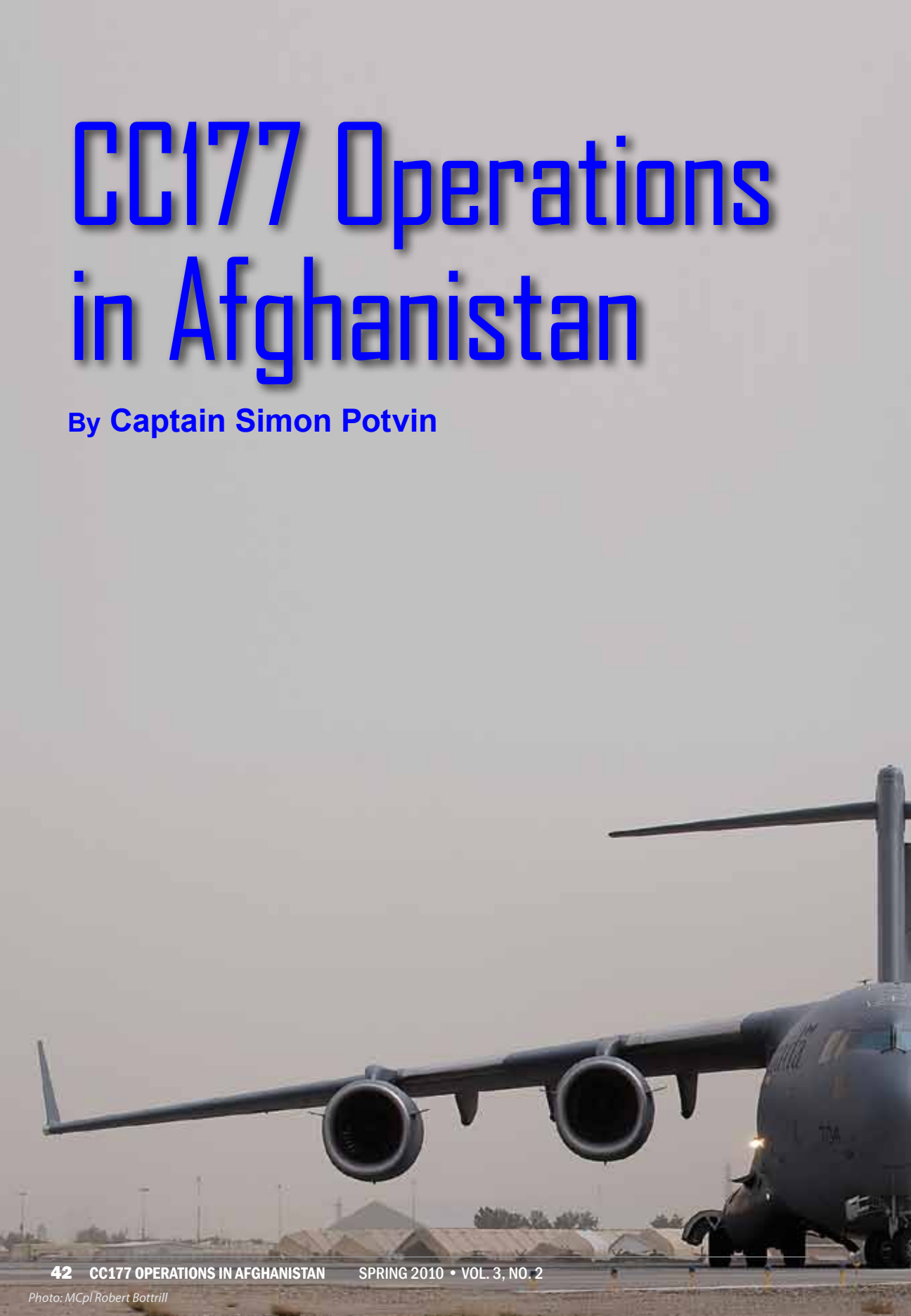


Photo: MCpl Robert Bottrill

More than 2 years have passed since the arrival of the first CC177 Globemaster, the "C17," in the Canadian Air Force. Since that time, 429 Tactical Transport Squadron, based in Trenton, Ontario, has had the role of operating this mammoth of the air. The incredible operational capacity of this airplane has made it the ideal choice for multiple operations serving the interests of Canada around the world. One of the main roles of this 4-aircraft fleet is to support the current Canadian mission in Afghanistan. Owing to its size, the C17 astonishes, boggles the mind and impresses, but we should never forget the team that is partially responsible for its success. The Squadron's pilots, loadmasters and technicians all play a major role in providing support to the Canadian mission on Afghan soil.

The Aircraft and its Crew

The C17 is capable of lifting a maximum load of nearly 77 tons (approximately 165,000 lbs). Regularly, on each flight, more than 55 tons of freight is transited between Canada and Afghanistan. With a cruising speed of more than 800 km/hr, the C17 is able to remain in flight up to 12 hours without refuelling. The longest flight logged by the crew members on a mission totals close to 9 hours. This flight is accomplished through a transit base in Europe via a transatlantic route with CFB Trenton, Ontario, as its destination.

While the airplane was designed to be operated by 3 crew members (2 pilots and one freight section head), the current crew assigned to support missions for the International Security Assistance Force in Afghanistan (ISAFA) normally consists of 3 pilots, 2 freight section heads, commonly called loadmasters in military jargon, and 2 technicians. This crew configuration gives each member a broader experience while at the same time ensuring that members can adjust without limits to the different situations that may arise during a mission.

Freight, Merchandise and Passenger Transportation in Afghanistan

The size of the cargo area of the C17 and its enormous ability to adapt, make this aircraft the preferred mode of transportation for sending material in support of the Canadian mission in Afghanistan. Geographically, Afghanistan does not border any bodies of water that would allow for goods to be transported by ship in support of the mission. This is why air transportation is the most secure and preferred method of supporting the operation. The C17 is used to transport all types of materials, including wheeled vehicles, logistical equipment and hazardous materials.

Another important task assigned the C17 involves the transportation of members during the rotation of units assigned to the province of Kandahar. This mission generally takes place every 6 months and lasts 7 to 8 weeks. During this period, the aircraft is used to effect the transition of outgoing personnel and personnel newly assigned to The International Security Assistance Force in Afghanistan. Generally speaking, 2 full crews are assigned this task. The first month, one crew handles all the flights and is subsequently relieved by the other crew for the second part of the personnel rotation. To ensure the maintenance of the aircraft on the ground, a detachment of technicians from 429 Squadron also accompanies the crew.

Planning and Execution of Logistic Support Missions to ISAF

Logistic support missions for operations in Afghanistan last an average of 7 days. Each mission can be divided into 3 parts, the first being strategic, the second being tactical, and the third again being strategic.

The first part consists of two runs that involve pre-positioning the aircraft. On the first day, the crew and their aircraft fly to a transit base in Europe. On the second day, they embark on a flight towards a destination somewhere in south-west Asia.

The second part consists of the tactical portion: the mission's primary objective. It is during this second phase that the cargo is delivered on Afghan soil. This part of the mission has Kandahar Airfield as its destination, the country's main port of entry for the majority of the nations operating in Afghanistan. Once the cargo is delivered, the plane immediately leaves again on the long return flight back to its home base. Once its initial cargo is delivered to Kandahar, the free space is re-used for another load returning to Canada. This maximizes the use of the freight area, and ensures that efficient use is made of the aircraft throughout its mission.

The third part includes the return flight to CFB Trenton, once the main objective has been completed. This third part also takes place over 2 days. It requires a flight to Europe with a stopover at a transit base. The following day, the crew carries out the last leg of the trip to Canada.

Pilot's Point of View

Nowadays, missions in support of the Canadian mission in Afghanistan could be considered routine by the crews of the C17. The destination, the objective, and the transit bases used during the outward and return flights are practically always the same. In fact, this is the only routine part of this kind of mission.

To maintain efficiency and accomplish the mission objectives in complete security, the required levels of training and knowledge remain very high. The environment in which the crew operates the C17 is constantly changing. As for the pilots, this requires them to continually refresh their knowledge of the airplane and the flight rules in conventional and tactical airspace. The crews of the C17 are faced with ever-present challenges.

At the beginning of each mission, planning flight routes to the other side of the globe can prove to be a difficult and frustrating task for the pilots. It is important to choose the most efficient air route possible while respecting the different diplomatic authorizations. Two factors can complicate the planning of the mission: the kind of freight transported on board, and the fact that the C17 is a military plane. Some countries do not permit military planes from other countries to overfly them. Moreover, some of them are prepared to deny access to their airspace depending on the kind of freight being carried on the aircraft. Consequently, the most efficient route is no longer directly between the point of departure and the destination, but rather one that corresponds to the different airspaces we are permitted to overfly.

The rules of international flight are constantly changing in response to the ever-increasing presence of commercial aircraft in the different airspaces of the globe. New systems and new procedures appear each year to support this increase in air traffic. It is incumbent on our pilots to learn these new procedures and to apply them to the letter; otherwise the security of the flight may be compromised. Today, the quantity and the level of knowledge of aircrews is constantly on the increase. This is why it is so important to remain abreast of any changes in rules and procedures. Not only are the security of the airplane and its crew at stake, but also the ability to achieve mission objectives without facing the consequences of flight rule violations and putting your own and the lives of others at risk.

Photo: Sgt Roxanne Clowe

Air traffic in the Afghan operational theatre has continued to grow since the beginning of the mission in 2001. The regulations governing tactical operational air space have required continual amendments in response to this increase in air traffic. This poses a daunting challenge to the members of the crew as they must constantly adapt their tactics to these changes. They must not only follow the rules, but at the same time minimize the risks that they face whenever they fly in the operational theatre.

The ground at the Kandahar Airfield is highly congested owing to the large number of countries on operations with the ISAF. To make it possible to handle the ever increasing number of airplanes, the time allotted to each unit for landing is limited. The crew of the C17 is given an operating window for each mission that must be respected at all costs, under penalty of being denied landing rights on Afghan soil. Another challenge faced by the loadmasters, who bear responsibility for the freight aboard the aircraft, concerns the time allotted to cargo loading operations on the ground. Not only do they have to ensure that operations are properly carried out, they must ensure effective coordination with the ground team when the cargo is being unloaded. All these procedures must be completed within the allotted time.

A Physical Fitness Challenge

Travelling across several time zones in a short time is another challenge that needs to be considered when it comes to support missions. A flight leaving Trenton for Afghanistan will cross 9 time zones just to go there, and take 2 days to do it. It is very difficult to adapt physically to these changes. This is why it is essential to be constantly aware of your physical and mental fitness, and to be smart and use the bunks on board to get some rest. Physical and mental fatigue can sneak up on you and may cause serious accidents, as we are often reminded in the aviation world. The members of the crew frequently experience the effects of jetlag several days after returning from the mission.

In conclusion, each member of the crew is not only responsible for performing their role to perfection, but must also support and assist their teammates for the length of the mission.

Conclusion

Despite the imposed routine and the host of challenges faced by the crew members, life in the air on board the C17 offers the opportunity to create inseparable bonds and a team spirit that makes each mission unique. On completion of each mission, the feeling of accomplishment makes it all worthwhile. Being able to support our troops in the theatre of operations, showing our colours around the world, is a feeling that is … indescribable!

Captain Simon Potvin was born in Quebec city in 1973. After flying in commercial aviation for numerous years, he joined the Canadian Air Force in 2004. Graduating from the multi-engine course in Portage, Manitoba in 2007, he went directly to fly the CC177 at 429 Squadron, 8 Wing Trenton.

List of Abbreviations

ISAFA	International Security Assistance Force in Afghanistan

Photo: Kevin W. Moore

AFGHANISTAN CONTINGENCY OPERATIONS

The Role of the CC177 Globemaster Aircraft Maintainer

By Corporal Timothy Templeman

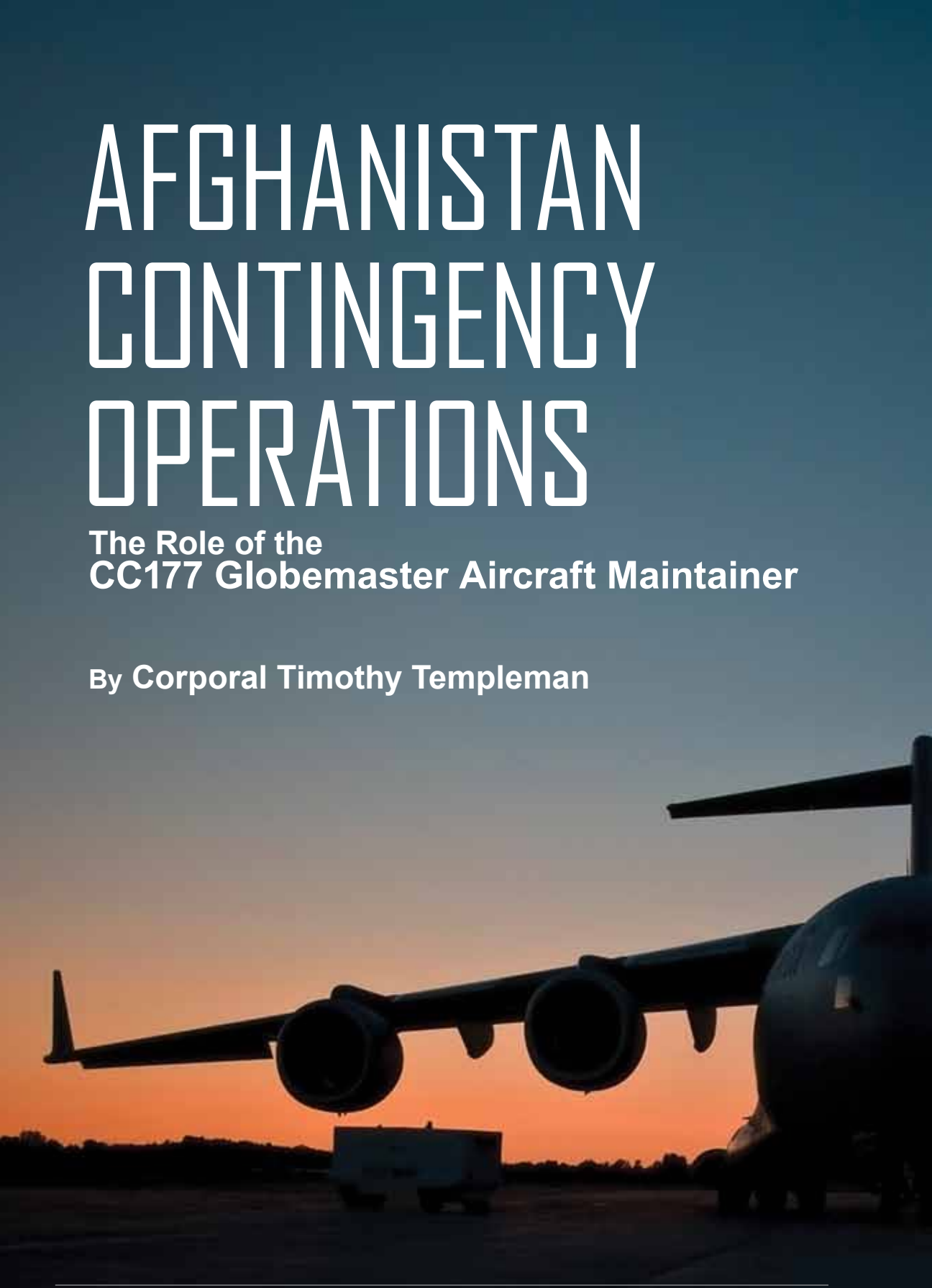


Photo: Cpl Igor Loutsiouk

The Boeing CC177 Globemaster III (hereafter referred to as the C17) is an impressive aircraft that affords the Canadian Forces (CF) for the first time a truly global, strategic airlift capability. In just a few short years this new air asset has become the main supply line for sustaining Canada's contribution to the NATO directed International Security Assistance Force in Afghanistan.

From an aircraft maintenance perspective, the state of the art C17 is well designed and relatively maintenance friendly, contrary to the other CF "legacy" aircraft fleet(s). However, due to the enormous size of the C17 airframe and complexity of modern aircraft systems, the fly-by-wire C17 Globemaster is particularly servicing intensive. A team of sixty maintenance personnel works diligently at home station to render Canada's four giant airlifters serviceable and ready to fly strategic airlift around the globe.

The first C17 Globemaster, tail number 177701 arrived in Trenton on August 12, 2007 and flew the Canadian Forces' first strategic airlift mission from Trenton to Afghanistan eighteen days later on August 30th. A key factor critical to extending this newly acquired airlift capability beyond 8 Wing Trenton main operating base is the re-introduction of the technical crewman (TCM) concept, not seen since the 1970s on the Dakota. The TCM concept basically extends some of the main operating base maintenance capability beyond home station on the road with the aircraft.

The C17 Globemaster is capable of flying very long hours and frequently demands prolonged crew days, followed by several hours of post-flight aircraft checks and servicing; therefore, aircrew rest potentially becomes an issue during missions requiring multiple stops in transit. However, without official in-flight duties the TCM is essentially able to extend the mission through crew rest periods by conducting transient servicing, troubleshooting, and maintenance action (if required) through mandatory crew rest periods.

Photo: MCpl Halina Folfas

CC177 Contingency Operations: Regular Sustainment Flights versus Relief in Place

The CC177 Globemaster III fleet provides the CF with a timely and relevant contribution to international operations that few countries are capable of sustaining. The CF now possesses a strategic capability to sustain our own lifeline in foreign operations (Afghanistan), and accomplishes this in two different processes: regularly scheduled sustainment flights originating from 8 Wing Trenton, and the semi-annual rotation of troops into and out of theatre.

Southwest Asian Sustainment Flights

Regularly scheduled sustainment missions to Afghanistan are flown from the main operating base at 8 Wing Trenton, Ontario, to the theatre in Southwest Asia via stops in transit. At their home station main operating base in Trenton, 429 Technician (T) Squadron (Sqn) maintenance personnel work diligently to provide around-the-clock maintenance and servicing coverage in order to ensure the C17 aircraft's airworthiness, readiness, and capability to execute assigned lines of tasking safely and effectively. In just a few short years, the highly skilled maintainers of 429 (T) Sqn have learned a new, highly complex aircraft platform while overcoming numerous challenges to ensure a high serviceability rate.

With any new technology, operators and maintainers face adversity when introducing a new capability into their inventory. Similar to the other aircraft fleets in the Canadian Forces' inventory, the C17 Globemaster maintainers must work through the unforgiving Canadian winter to provide serviceable aircraft.

With the lack of a suitable (permanent) hangar and an overcrowded apron, the cold weather / environmental challenges caused by operating in austere conditions have been plentiful. The majority of maintenance outside of regularly scheduled 120-day and 180-day home station inspections checks, similar to periodic

Photo: WO Serge Peters

Photo: WO Serge Peters

inspections on the other Air Force legacy fleets, has been carried out on the flight line due to the lack of a suitable hangar. Even with the recent opening of a new, austere (temporary) one-bay hangar in Trenton, now available for restricted maintenance use, the remaining aircraft are parked outside on the freezing cold east apron (east ramp). Unfortunately, the C17 doesn't respond very well to the unfavourable Canadian winter. Frozen potable water lines, iced-up engine nacelle covers, cold electronic engine control computers, frozen landing gear jacks, and jammed bleed air valves are a few of the cold weather snags that require ingenuity and innovation by maintenance technicians to solve.

The C17 is charged with flying ongoing and often tightly scheduled sustainment flights into theatre from 8 Wing Trenton. Without top-notch maintenance support at the main operating base, the C17 and aircrews would not be able to accomplish their mission. The work that technicians must accomplish in order to ready an aircraft for a Southwest Asia mission is astounding. Upon returning to Trenton after a Southwest Asian mission, technicians are often required to have the C17 serviceable for the next Southwest Asian mission in less than twelve hours. In half a day, aircraft marshalling, servicing, solving/rectifying maintenance snags, software updates, aircraft maintenance paperwork, coupled with a four- to seven-hour pre-launch (ramp) time for loading the aircraft, are activities technicians are required to carry out within this tight transition period.

Typical Southwest Asian missions involve several days of transit time to and from theatre; therefore, concurrent aircraft servicing and other maintenance functions are required while on the road, and these functions are carried

Photo: WO Carole Morissette

out by two TCMs that accompany the aircraft. The TCM concept has proven to be especially beneficial on missions where limited Canadian maintenance support is available both during stops in transit and in-theatre. Having avionics and aviation systems technicians, subject matter experts in their own fields, on-hand to provide servicing, maintenance expertise, troubleshooting, and snag rectification has proven to be an invaluable and absolutely essential component of the C17's mission.

Relief in Place

Further to weekly sustainment, Southwest Asian missions flown from the 8 Wing Trenton main operating base, 429 (T) Sqn is tasked with relief in place (RIP), the semi-annual rotation of approximately two thousand personnel into and out of the Afghanistan theatre of operations.

A large number of chalks are required to cycle the massive number of personnel into and out of the theatre of operation. The RIP is essentially a deployment for squadron personnel; the deployed maintenance contingent from 429 (T) Sqn must be self-sufficient while away from the Trenton main operating base for the nine- to eleven-week RIP. Between twelve and fifteen maintenance personnel (technicians, maintenance managers), plus aircrew, along with an inventory of spare parts, tools, and aircraft maintenance support equipment, deploy with the C17 aircraft to a forward Southwest Asia operating location to carry out the RIP.

During the RIP, technicians maintain the aircraft from both the Southwest Asian forward operating location and in the Kandahar theatre of operations; technicians also carry out the role of flying TCM. The aircraft is checked, inspected, and serviced prior to departure from the forward operating base, and also in situ while on the apron at the sprawling Kandahar Airbase.

In the autumn of 2009, the RIP was carried out from Pathos, Cypress, in

the Mediterranean, some five hours flying time away from the Kandahar area of operation, which consequently rendered the CC130 Hercules, also used in previous RIP sorties from Southwest Asia, ineffective. The C17 Globemaster was the lone platform used for the RIP. 429 (T) Sqn was the lone flying and maintenance squadron tasked to transfer people into theatre and return the others to Cypress for decompression and consequent return to their families at home in Canada.

429 (T) Sqn and support personnel were able to successfully move two thousand people to and from Afghanistan despite having to overcome numerous logistical and cultural difficulties. New, unfamiliar surroundings, a language barrier, lack of coalition ground support, and the sheer distance away from the Kandahar Airfield area of operations (2,943km) were some of the challenges the squadron overcame to provide a successful RIP. ■

Corporal Timothy Templeman was born in Charlottetown, Prince Edward Island in 1976. He graduated from the Canadian Forces School of Aerospace Technology and Engineering (CFSATE) in 2003 as an Aviation Technician (Avn Tech). He has been posted to 8 Air Maintenance Squadron (8 AMS) in Trenton, Ontario (CC130 Hercules - propulsion systems), to 440 Transport Squadron, Yellowknife, North West Territories (CC138 Twin Otter), and to 429 Transport Squadron, Trenton, Ontario (CC177 Globemaster III). He currently resides in Frankford, Ontario.

List of Abbreviations

CF	Canadian Forces	sqn	squadron
NATO	North Atlantic Treaty Organization	T	technical
RIP	relief in place	TCM	technical crewman

Photo: MCpl Robert Bottrill

Photo: MCpl Robert Bottrill

A SOLDIER FIRST:
BULLETS, BUREAUCRATS AND THE POLITICS OF WAR

BY GENERAL RICK HILLIER (RETIRED)

TORONTO:
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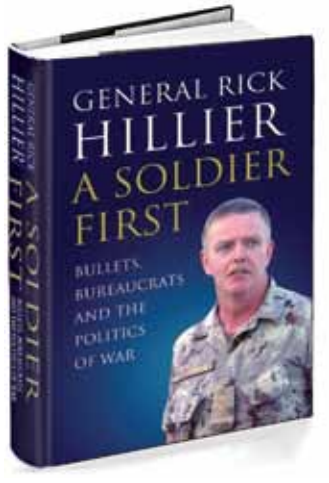
498 PAGES ISBN 978-1-55468-491-5



Review by **Major Paul Fleury, CD**

A Soldier First by General Rick Hillier (Retired) is an awe-inspiring story of his long and distinguished career and his visionary transformation of the Canadian Forces. The book, like General Hillier's career, is nothing, if not two things: a source of controversy for supporters and critics alike; and, an opportunity to heap praise on Canada's service men and women. He successfully portrays himself as a tough talking champion of the common soldier, sailor, and airman, and a leader with the ability to achieve his purposes. The book is dedicated to "Canada's sons and daughters who serve our nation in the Canadian Forces." This is a clear indication of the overwhelming pride the former Chief of the Defence Staff (CDS) has for the men and women in uniform and certainly is one of the many reasons General Hillier was so popular and affectionately known as "A Soldier's Soldier."

General Hillier was destined for a career in the military when at the age of eight, from his home in Campbellton, Newfoundland, he constantly wrote to Canadian Army recruiters attempting to enlist. Not knowing his age, army recruiters attempted to recruit him. Rick Hillier finally enlisted at the age of 17, immediately after high-school graduation, and then went on to obtain a BSc at Memorial University in St. John's, Newfoundland. The book carries us along his rise through the ranks during the successive decades of darkness that rendered the Canadian Forces ineffective during the Trudeau, Mulroney, and Chrétien governments. As his career blossomed, General Hillier quickly became a player on the international scene, commanding an American corps in Texas and a multinational NATO task force in Bosnia-Herzegovina. But it was his role as Canada's CDS that defined him as a Canadian icon. The book is full of lessons that General Hillier learned as he progressed through the ranks and that are certainly applicable to his wide-reaching audience, such as "always do the right thing" and "remember and recognize good people."

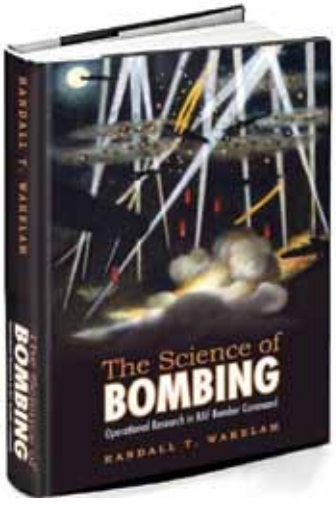
I believe there are two public perceptions of General Hillier: one is associated with Canada's entry into and role in the Afghanistan war; the other is of him as the orchestrator of the Canadian Forces' transformation into a more agile, combat-capable fighting force. Both these perceptions will undoubtedly be hotly debated for years to come, and have already become a source of controversy for the book. In the book, General Hillier seems to distance himself from the decision-making process for the entry into the Afghan war. He indicates that he wanted to stay in the safe area of Kabul and take on the responsibilities around the airport, but that no one in Ottawa would listen to his recommendations. He also claims that

when he came on board, the government had already decided to go to Kandahar, the more dangerous and aggressive option; the Defence Department, the Canadian International Development Agency, and the Department of Foreign Affairs were already well into planning that mission. However, there are many critics of the book, in particular Janice Gross Stein (political scientist) and Eugene Lang (assistant to former Liberal Minister of National Defence Bill Graham), who wrote in *The Unexpected War: Canada in Kandahar*, that General Hillier was the architect of the plan that would involve Canada more and more deeply into the most dangerous regions of Afghanistan. They accuse Hillier of trying to impress the Pentagon and US President George W. Bush. Former Prime Minister Paul Martin in his book *Hell or High Water* also speaks about General Hillier's enthusiasm for the Kandahar mission, which is further evidence that perhaps Hillier had more to do with it than his humble writings suggested. As well, in his book, General Hillier indicates that in a much contested memo he wrote in 2003 to then Chief of the Defence Staff General Ray Henault that he was discussing the need for **all** services of the military to work better both at home and overseas, and the need for a bigger budget to make that happen. However, the memo has since revealed that General Hillier actually predicted that Canada's Air Force and Navy would have limited roles in future conflicts and, therefore, greater investment in Canada's land forces (at the expense of the other services) would be better value for the money.

Still, it is clear that once General Hillier became CDS, he was a better advocate for all the services than any previous CDS. He took the battle for modernization of the Canadian Forces into the public eye and to the politicians who would have to support him. There is no doubt that he used the Winnipeg floods, and later the ice storm of 1998 in eastern Canada, to set the stage for the public's renewed respect for the Canadian Forces. He fully admits this in the book. He also takes shots at those he perceives as critics of the military and himself. In this regard, the book is a rewarding read. However, the book does lack an in-depth look at those often unsung heroes, the spouses and families of those serving in the Canadian Forces, including his own wife. General Hillier does a good job of extending dignity and respect to those families who have lost loved ones. He is less skilled at depicting his military life as it was viewed through the eyes of his wife, Joyce, although he occasionally makes the attempt to do so.

General Hillier is a good but not a great writer. His book is an excellent source and an easy read for those in the military, and for those civilian supporters and critics of the military. It provides an insight into the decision-making process of senior leadership as well as a glimpse of the personality traits of a man that epitomizes all that is Canadian. His workingman prose is appropriate to this combination biography of a fairly ordinary yet extraordinary guy and the history of the transformation of the Canadian Armed Forces. In a strange yet masterful way, Hillier describes the historic changes he marshaled as though he were only an observer, or that the changes were somehow inevitable. Yet, many would argue to the contrary, that Hillier was the critical dynamic behind those changes. Indeed, Hillier pulled no punches in his book or in his career, demanding more funding, more troops, and more appreciation for the women and men fighting wars on foreign soil. He takes the opportunity to attack the bureaucrats that stood in his way without actually naming them, a tribute to his outstanding qualities. General Hillier will undoubtedly go down as one of the greatest generals in Canadian history and his book will be a hit with audiences from all walks of life. ■

Major Paul Fleury, an Aerospace Control Officer, is currently in the Command Section of the Canadian Forces Aerospace Warfare Centre working on Aerospace Control Doctrine.



THE SCIENCE OF BOMBING:

OPERATIONAL RESEARCH IN RAF BOMBER COMMAND

BY RANDALL T. WAKELAM

TORONTO; BUFFALO:
UNIVERSITY OF TORONTO PRESS, 2009
262 PAGES ISBN 978-0-80209-629-6

Review by
Major Tim Gushue, MMM, CD

Never judge a book or, hopefully, its reader by the cover. These words occurred to me as I proceeded through airport security with this volume's largest, singularly most visible word, "BOMBING" emblazoned boldly on the cover, in my hand. Time to stow it slowly and discreetly. Though inauspicious, it was the beginning of an illuminating and rewarding foray into this relatively unstudied aspect of the Second World War strategic bombing campaign. *The Science of Bombing: Operational Research in RAF* [Royal Air Force] *Bomber Command* by Randall Wakelam provides an in-depth and scholarly approach to a field generally inaccessible to either the specialist or general reader. To this day, vociferous and emotional debate fuels the controversy about the morality, cost, effectiveness, and contribution to victory of the bombing offensive against Germany. In light of this continued and lively discussion, it is timely to have a dispassionate analysis that aims to capture, in today's vernacular, the real-time scientific perspective that continuously evaluated and measured the Command's performance with the aim of improving this weapon throughout the war.

Wakelam follows the development of strategic bombing, and the response to the catastrophic losses suffered by Bomber Command in the early stages of the war that necessitated the switch to night-time bombing. With Britain driven from the Continent and in retreat everywhere, it became the principal offensive weapon that could be brought to bear to strike the enemy while invasion forces were gathered and prepared for the Allied conquest of Europe and campaigns elsewhere. The assessments and proposals of the Operational Research Section did much to inform those charged with developing and implementing a war-winning offensive strategy for RAF Bomber Command.

Wakelam's explorations highlight the remarkable degree of cooperation between the operational research scientists and those engaged in offensive operations. This was a natural evolution. As losses mounted, awareness grew that raw courage and determination could not, alone, achieve victory. Science had to be applied to reduce losses of airmen's lives and equipment while promoting efficiency. The collaboration between scientists and operators yielded important lessons on navigation and in accurately concentrating the maximum weight of bombs onto targets. Vitally important also was protecting crews and machines, as far as possible, from loss through enemy action and through accidents. Unlike most research and clinical trials, their laboratory was the

operational theatre, where false leads, mistakes, and even successes were measured in lives and aircraft lost, weighed against the damage inflicted on the enemy. This attached supreme importance to their work and influenced strategic planning.

Though focussing on the work of Operational Research Section scientists, there is much that prevents this work from being a clinical and sterile laboratory analysis. The human dimension is skilfully blended with the science as we come to understand how those responsible for the prosecution of the war were influenced or constrained by technology and tactics as they struggled to develop a war-winning strategy. In many instances, leaders simply had to use the weapons available in as efficient a manner as possible, striving and hoping for breakthroughs that would give a decisive edge against an equally determined foe. Wakelam's research gives cause to question the validity of allegations of Air Marshal Sir Arthur "Bomber" Harris' amoral ruthlessness in the prosecution of the war on Germany, and of his detractors' claims concerning an alleged indifference to loss.

This book is about the magnificent partnership of operators and scientists, collaborating effectively under the pressures of war and national survival. In today's military climate of "lessons learned"; "best practices"; "paradigm shifts"; and "process improvement," this book highlights the value of all of these efforts, regardless of the labels, as we endeavour to apply knowledge to gain advantages and agility in our efforts to outmanoeuvre our resilient and implacable opponents. Intuition on its own offers important clues, but lacks the substance to give real force to action. However, intuition, when vindicated and occasionally led by science, becomes an irresistible force that can yield meaningful and far-reaching change.

This is an essential source document for anyone interested in getting to the fundamentals and truly understanding strategic bombing and how Bomber Command evolved into the awesome and fearful weapon that it was by 1945, and in applying those lessons in today's war-fighting context. ■

Major Tim Gushue, an Air Logistician (Human Resources), is the Regional Manager for Conflict Management Services (Central Canada) and the Conflict Management Advisor (Air Force) based in Kingston, Ontario, as part of Department of National Defence's Director General Alternative Dispute Resolution, a joint programme of the Chief of Military Personnel and the Assistant Deputy Minister (Human Resources - Civilian).

MY FIRST ENGINE FAILURE

Composite by CFAWC

By Captain Kevin Coulombe

I suspect that most pilots of "real airplanes" think that unmanned aerial vehicles (UAV) lessons learned are not applicable to them. Hear me out: I think I learned a lot of lessons during my time at Kandahar Airfield (KAF) that will help me be a better pilot on a "real airplane." As a new Canadian Forces (CF) pilot on deployment in Afghanistan with the CU170 Heron Detachment, I had the opportunity to work through an engine failure on a single-engine aircraft. This opportunity provided me several lessons that I would like to share.

Well before the engine-failure related excitement began, I made a couple of important realizations. When KAF was cast under marginal weather early in our tour, there was significant pressure to get the unit operational. It quickly dawned on me that as the aircraft commander (that's weird to say for a UAV), I had to make the decision on whether or not the Heron would fly. This was a shock coming from a training environment where I was constantly surrounded by a wealth of experience where we had consistently erred on the side of caution. Back at the squadron, I would have been a first officer for a couple of years before being faced with this kind of pressure, and as tough as it was when we arrived, I think it provided a great opportunity for accelerated learning.

The first lesson that I learned from the engine failure was—despite what you would think—a smoking engine that you see through a tail-mounted camera on a $10-million UAV will get your heart racing. This feeling was accompanied by the often described "this can't really be happening to me" thought. I took a split second to dismiss these feelings, turned toward the base, declared an emergency (twice… it's a complicated airspace) and got ready to become a glider pilot. From the area in which the aircraft was operating it would be tight to make it home if the engine were to fail immediately. Luckily, that didn't happen, and I was able to maintain altitude long enough to get above the glide profile.

While setting up for the approach, I had a couple of quick decisions to make with respect to how I was going to proceed. First, given that the winds were light and I was off the departure end of the runway in use, I told Kandahar approach that I would be taking an opposite-direction landing. There was no discussion about whether or not this was allowed; I was just going to do it. On a later incident, when I **requested** an opposite direction, they went through the process of getting it approved despite the fact that I had declared an emergency. It turns out that telling

Photo: Cpl Andrew Saunders

air traffic control (ATC) what you will do in an emergency really is different from asking them for permission.

The Heron has a hard time capturing the glide slope from above due to its design, which mimics a high performance glider. With a failed engine we were taught to fly to a three-mile final and conduct S-turns until the aircraft is 1.5 to 2 degrees above the normal 4-degree glide slope. The propeller on a failed engine is designed to windmill at full fine pitch to aid in a restart. This feature destroys the Heron's glide potential, thus creating the 5.5- to 6-degree glide profile.

According to our training, once the emergency landing function is selected, the flaps should automatically retract and be unavailable for use. With a running engine, a seven-kilometre tailwind, and no flaps, there was a pretty good chance that I would overshoot the runway if I tried to land from 1.5 degrees above the glide slope. Because of this, I decided to turn inbound slightly above the 4-degree normal glide slope, but well below 5.5-degree engine out glide slope.

You can imagine my surprise when I discovered that the flaps would in fact be available for use (the flaps in this aircraft deploy to 90 degrees, so a large speed-brake would be a more accurate description). It turns out that no matter how much you play with a simulator there is no substitute for a real scenario. The simulation helps, but there are some things that only happen in real life when there's no reset button.

The engine eventually seized in the flare and other than that the landing was uneventful. Reflecting on it all, there's very little that I would have done differently; however, I wish I had known beforehand what the differences were between the simulation and reality. My final lesson of that day occurred when the aircraft almost got bulldozed off the runway for some min-fuel (minimum-fuel) Vipers overhead.

Communication in a multinational environment can be difficult at times. After the engine failed, the aircraft was stuck on the runway awaiting a tow crew to pull it off. After spending five minutes in the middle of the only runway in KAF, the tower was anxious to get the UAV off the runway. Realizing the trouble I was causing, I asked them if the fire department would be willing to push the UAV off the runway to make way for the F16s (I had called for the trucks when the engine temps started to rapidly climb). When I made the request I envisioned a few firefighters pushing on the wings to roll the aircraft off the runway; it weighed approximately 1100 kilos at the time. When two members from our headquarters (HQ) found a hole in the airfield fence and ran out to do just that, they found that the fire department's interpretation of "push" involved the use of a truck, and more closely resembled a bulldozing scenario. That was almost a very expensive lesson in communication.

I remember a distinct hit of adrenalin that accompanied the realization that this was actually happening to me. The tapes may not reflect an absolute reality; I sound surprisingly calm in the replay. I have realized since then that it would be fairly easy for an observer who has the luxury of analysing the events after the fact to draw faulty or misled conclusions based on the limited information that can be seen and heard on the tapes; unfortunately, the thought processes involved are not on the tape. To me, this incident underlined how important is the understanding of a situation when analysing the actions of another from the comfort of a desktop.

One last lesson—on the bright side, I learned that with no oil pressure, a Rotax engine can last approximately 10 minutes before it seizes. ■

Captain Kevin Coulombe graduated from Royal Military College (RMC) in 2005 and received his wings in 2007. Captain Coulombe deployed to Kandahar December 2008 to July 2009 as a pilot and mission commander of the CU170 Heron UAV where he received a Flight Safety "For Pro" award as well as a Task Force Commander's commendation. He is currently posted to 424 Squadron as a pilot awaiting the CC130 Operational Training Unit.

List of Abbreviations

ATC	air traffic control
CF	Canadian Forces
HQ	headquarters
KAF	Kandahar Airfield
RMC	Royal Military College
UAV	unmanned aerial vehicle

Photo: Cpl Kevin Sauvé

PUSHING THE ENVELOPE

FUTURE? CAPABILITIES FOR DISASTER RELIEF

by **Major Bernie Thorne, MSc, CD**

The earthquake that occurred January 12, 2010, in Port-au-Prince, Haiti, was a disaster on a scale only seen a few times per decade. We would be naïve to think that a disaster of similar consequences could not occur in Canada. As Canadians, we already see major floods, hurricanes, ice storms, and forest fires. Predictions of changing weather patterns might see these increasing in frequency and/or severity. These civil disasters can result in a loss of potable water, communications, transportation, power, etc. The threat of a catastrophic earthquake or tsunami is ever present for some Canadian cities, and effective response would require extensive services such as search and rescue, medical, and shelter. These disasters and the relief capabilities needed to help those in distress must be considered beforehand, with equipment and training already in place. The Air Force (AF) and Department of National Defence (DND) have not adopted new technologies that can provide significant benefit for little cost. This short article introduces several systems and capabilities that are worthy of immediate consideration.

DND does not hold the responsibility to coordinate response to disasters; that is held by Public Safety Canada at the federal level, and by the provincial and municipal emergency measures organizations. DND does, however, contribute significantly to emergency response on a regular basis. Some elements of DND, such as the Disaster Assistance Response Team (DART), are formed and equipped specifically to respond to major international disasters. Other elements of DND seem to respond almost as regularly: C17s and Hercules for airlift; CP140s where surveillance assessment is required; Army engineers for effecting critical infrastructure repairs; and navy ships with broad response for almost any coastal disaster, etc.

Each disaster scenario involves response from a wide array of agencies. Effective, coordinated response requires accurate awareness shared amongst the responder group, and the enabling of command and control of the response. We have seen repeatedly in Canada, and on the scene of international disasters, that responders are not interoperable, and that extraordinary measures are required to share information between agencies. This critical shortfall was noted in the Auditor General's 2009 report.[1] Assuming that appropriate agencies could have come to agree on standards for interoperability in disaster response, what type of response could have been delivered to Haiti? Colonel (US) Buck Elton was very early on the ground in command of the Joint Special Operations Air Component-Haiti. As he observed, "For the first week, we were virtually the only people in the country who had communications, food/water, transportation, tents and security."[2]

The lead agency or other significant headquarters (HQ) deploying to a disaster scene can take near-instantaneous communications infrastructure with them. A small cargo crate can carry a small tethered balloon. Communications can be voice or data relay. Cell phone technology is more likely to be applicable for major disasters with a large number of responders. It can be hung from underneath the balloon, giving communications to a large number of users. To limit the use to responders, subscriber identity modular (SIM)[3] cards that allow cell phone network access can be distributed by the HQ or associated provider. The HQ can thus record the phone numbers in use and maintain a phone book for all responders and local authorities. Global positioning system (GPS)-enabled cell phones permit near real-time position reporting of the responders.

Third-generation cell phone technology could be used under these tethered balloons and can allow access of data either from smart phones or from universal serial bus (USB) sticks plugged into computers. If several significant HQs are on-scene, the cellular network can link their local computer networks. It might be beneficial to maintain redundancy and have critical data available at all times. If any of the HQs are connected to the world at large via satellite communications, then the most significant data could be shared to the responder community around the world. The United States (US) Southern Command has created an on-line community of interest for Haiti on the All Partners Access Network (community.apan.org) that seeks to connect the various responders. Colonel Elton, Commander of Joint Special Operations in Haiti, noted the serious operational impact caused by lack of communications and situational awareness between various international responders: "We had 40-50 diverts a day for the first few days because there were no flow control measures to meter the number of aircraft that wanted to land here."[4]

In addition to the near-immediate provision of communications infrastructure, the tethered balloons could also carry stabilized day/night cameras with high zoom capability to provide situational awareness in the immediate environs. Small unmanned aerial vehicles (UAVs), such as the Skylark,[5] voluntarily flown to survey the status of rural Haitian orphanages, could be used to widen the range of situational awareness. Understanding where there is damage, displaced population, etc., allows for accurate decision making on the most appropriate response.

Weather can easily incapacitate the smaller balloons. They would have to be pulled down during bad weather, but if a quick-assemble tower was following, the cell phone box could be moved over as soon as an appropriate tower, building, or hill was secured and safe. If the capacity of the network is underutilized, it could be opened up to the local population over certain periods. Battery chargers, either solar or hand-cranked, can provide adequate power to maintain cell phones indefinitely in the field.

In the near future, a high-altitude airship could fly itself over a disaster area and provide communications and radar coverage. Synthetic aperture radar can conduct damage assessment of buildings, bridges, etc., and provide dismounted target indication to locate mobile, potentially displaced survivors. These high-altitude airships could remain as long as required, would not be affected by weather, and would remove the need for operators on the ground in the disaster area. Near unlimited bandwidth could be available as these high-altitude airships are above weather and could communicate to the satellite networks using free-space optics. If you can talk to the airships, you can talk to the world.

Equivalent levels of potential benefit with new capabilities can be seen when considering movement of goods into a disaster area. This is especially true where critical transportation infrastructure is damaged. In Haiti, we were fortunate to have had the single runway airport in Port-au-Prince remain operational. The port infrastructure and roads through towns saw damage and reductions in capacity, yet there was a critical need to move massive amounts of relief goods.

We see that standard sea containers are being fitted as HQs, medical centres, water filtration units, power generation units, etc. These high value uses are in addition to the potential for the containers to be used to keep large amounts of water, food, medicine, and shelters safe, from packaging to delivery. If the ports are damaged or are remote, however, how can the containers be delivered rapidly to where they are needed?

We saw the loads broken down at the disembarkation points, and significant effort employed to distribute them over wide areas. This cost large amounts of effort, slowed the distribution, and resulted in choke points at the airport or seaport. Helicopters may speed the distribution of critical goods and relief personnel, but do not resolve the core problems. An airship could lift sea containers directly from the deck of a nearby ship and deliver them precisely to where the supplies are needed. An empty container is a relatively safe and dry building for storage or residence, and would be left until after the clean-up is complete.

For any of these technologies to enable the fastest and most efficacious response to disasters, we need agreements nationally and internationally as to what interoperability or compatibility standards we will use for communication, reconnaissance, and other data. These standards will need to be open, as we want the widest number of companies in every country to be building systems that can work together. These standards will also have to grow and evolve as we learn new ways to help those in need.

If standards were agreed to by national or international agencies, then the responder agencies, including DND, could begin to consider appropriate installation of the various technologies on current and future assets. Would Canada's DART deliver more benefit by being able to deploy with a communications aerostat? Do we expect the CP140 to downlink data real-time to emergency measures organizations?

The AF has a significant contribution to make to international and national disaster relief. It is our responsibility to educate our decision makers on what capabilities are required and the potential technologies available to fulfil them. Canada has the potential to "be on the ice" for international standards for interoperability. We need only leadership and collaboration to create synergy in the response far beyond what is elicited today. The funding, training, and technical expertise necessary for success are all minor in comparison to the alternative of not taking action now. The only real question is: "which of our countries will be next?"

P.S. The US Defence Information Systems Agency conducts annual demonstrations of these types of technologies. The next demonstration/conference is scheduled for May 3 to 7, 2010 in Nashville, TN. Canadian Forces Aerospace Warfare Centre (CFAWC), Air Force Experimentation Centre (AFEC), and the Operational Research section of Defence Research & Development Canada (DRDC) are working together to identify where future platforms, such as aerostats and airships, among other options, are likely to be effective and efficient. The first look of this report is planned for end-March, 2010. DRDC Ottawa and AFEC are conducting a live experiment in Suffield, AB, during June 2010, to initiate an experimentation stream using aerostats and UAVs for communications and situational awareness. ■

Major Bernie Thorne is a member of the CFAWC detachment in Ottawa where he is the section head for the AFEC. Considered one of the important parts of the "engine of change" for the AF, the members of AFEC conduct projects and experiments that are carefully weighed and considered to deliver the most net benefit to Canada, through considered change to DND and the AF. Those interested in looking at the various projects underway, recommending new ones, or joining the team, may look on the CFAWC web page [DWAN http://trenton.mil.ca/lodger/CFAWC/Index_e.asp] [Internet http://www.airforce.forces.gc.ca/CFAWC/CFAWC_e.asp]. Bernie.Thorne@forces.gc.ca 613-949-6408

List of Abbreviations

AF	Air Force
AFEC	Air Force Experimentation Centre
CFAWC	Canadian Forces Aerospace Warfare Centre
DART	Disaster Assistance Response Team
DND	Department of National Defence
DRDC	Defence Research & Development Canada
GPS	global positioning system
HQ	headquarters
SIM	subscriber identity module
UAV	unmanned aerial vehicles

Notes

1. *Report of the Auditor General of Canada–Fall 2009*, Emergency Management-Public Safety Canada. Available at http://www.oag-bvg.gc.ca/internet/English/parl_oag_200911_e_33252.html (accessed March 3, 2010).

2. Buck Elton, Haiti: Boots on the Ground Perspective, *Small Wars Journal*. Available at http://smallwarsjournal.com/blog/2010/01/haiti-boots-on-the-ground-pers/ (accessed march 3, 2010).

3. The subscriber identity module card or SIM card is in every cell phone. It contains the information required to connect to the local network. Some people who buy or lease phones from local providers may not be aware of this little changeable piece in "unlocked" phones.

4. Buck Elton, Haiti: Boots on the Ground Perspective, *Small Wars Journal*. Available at http://smallwarsjournal.com/blog/2010/01/haiti-boots-on-the-ground-pers/ (accessed march 3, 2010).

5. Flown by Evergreen Unmanned Systems and Elbit Systems. Thousands Help Millions, *Aviation Week & Space Technology*, February 8, 2010, 12.