

THE ROYAL CANADIAN AIR FORCE JOURNAL

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IN THIS ISSUE:

**AIR POWER,
COUNTER-INSURGENCY
AND INFLUENCE**

**CC150 POLARIS AEROMEDICAL
EVACUATION BEDS**

**WHAT WAS THE PRIMARY
REASON FOR THE COLLAPSE
OF THE FRENCH AIR FORCE
IN 1940?**

**AIR POWER'S CONTRIBUTION
TO COERCION**

AND MUCH MORE!



PRODUCED BY
THE CANADIAN FORCES
AEROSPACE WARFARE CENTRE



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

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THE ROYAL CANADIAN
AIR FORCE JOURNAL



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

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ITEM	WORD LIMIT*	DETAILS
LETTERS TO THE EDITOR	50-250	Commentary on any portion of a previous <i>Journal</i> .
ARTICLES	3000-5000	Written in academic style.
BOOK REVIEWS	500-1000	Written in academic style and must include: <ul style="list-style-type: none">• the book's complete title (including sub-title);• the complete names of all authors as presented on the title page;• the book's publisher, including where and when it was published;• the book's ISBN and number of pages; and• a high resolution .jpg file (at least 300 dpi and 5 by 7 inches) of the book's cover.
POINTS OF INTEREST	250-1000	Information on any topic (including operations, exercises, and anniversaries) that is of interest to the broader aerospace audience.
PUSHING THE ENVELOPE	250-2000	Forum for commentary, opinions, and rebuttal on <i>Journal</i> articles and/or issues that are of interest to the broader aerospace audience.

* Exclusive of endnotes

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- All supporting tables, images, and figures that accompany the text should be sent in separate files in the original file format (i.e., not imbedded in the text). Original vector files are preferred; high resolution (not less than 300 dpi) .psd, or .jpg files may be submitted.
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- Acronyms and abbreviations should be used sparingly:
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- The Senior Editor reserves the right to edit submissions for style, grammar, and length, but will not make editorial changes that will affect the integrity of the argument without consulting the author.

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4 EDITOR'S MESSAGE

5 LETTERS TO THE EDITOR



ARTICLES

7 **AIR POWER, COUNTER-INSURGENCY AND INFLUENCE:** the British experience during the period 1945–1976

By Mark Clegg

16 **CC150 POLARIS AEROMEDICAL EVACUATION BEDS:** The Challenge for the Design Engineer – Supporting Our Front Line Troops Worldwide

By David Smith, Major Dominique Laplante, and Captain Sophie Lavoie

22 **WHAT WAS THE PRIMARY REASON FOR THE COLLAPSE OF THE FRENCH AIR FORCE IN 1940?**

By Colin Gilmour

30 **OPERATION UNIFIED PROTECTOR:** Understanding the Combined Air Operations Centre (CAOC)

By Major Ken Craig, CD

38 **AIR POWER'S CONTRIBUTION TO COERCION**

By Lieutenant-Colonel Brian L. Murray, CD

POINTS OF INTEREST

53 **TERMINOLOGY TALK** {Article 4}

By Major James Bound, CD, BSc (Hons)

58 **APPLYING AEROSPACE POWER AT THE OPERATIONAL LEVEL OF WAR:** the Time-Space Challenge

By Lieutenant-Colonel John R. Anderson, CD

BOOK REVIEWS

64 **HELLFIRE** Review by Captain Scott Fuller (Retired), CD

65 **WALKOUT** Review by Lisa Moulton

66 **WORLD ON THE EDGE** Review by Major François Dufault, CD

68 **THE AGE OF AIRPOWER** Review by Second-Lieutenant Crystal Parsisson

EDITOR'S MESSAGE

This is the first opportunity I have had to write my editor's comments for The Royal Canadian Air Force Journal (RCAFJ). I must admit that it still seems a bit surreal to see "RCAF" on so many of the documents that cross my desk every day; however, I will get used to it.

In my unit, as I am sure is the case across the RCAF, much of the "water-cooler" chatter is focused on the budget and what it means to the Canadian Forces in general, and the Air Force in particular. You always know that something is in the wind when you start to hear those oft-repeated phrases like, "we have to learn to work smarter, not harder," and "we have to get better at managing change," as well as my personal favourite, "we will be leaner, but more capable." Although you would think that these "words to live by" have been spawned by recent events, a casual read of the history of the RCAF will show that sentiments behind these words have been with us for almost as long as there has been military aviation in Canada.

Indeed, the cyclical nature of our history underlines how the RCAF, as a government entity, must expect to do its share when priorities shift due to the passing of a crisis, rising economic pressures, or a combination thereof. Hence, individuals caught up in "The Big Cut" of 1932–33, when the RCAF's budget was slashed by almost 76 per cent and a fifth of the service laid off, would understand the economic forces that drove the government of the day in the 1990s to implement reductions that resulted in Air Command shrinking from just over 19,000 Regular Force personnel in 1990 to approximately 13,500 by 1998. And individuals who had endured six years of

conflict during the Second World War understood why the RCAF downsized from its peak of 215,200 in January 1944 to less than 12,000 by 1947; simply put, the war was over and the crisis had passed. Fast-forward to 2012. The end of our combat role in Afghanistan, combined with a volatile economic environment, make adjustments to the RCAF inevitable ... not easy ... but inevitable.

So as we challenge ourselves to do more with less, find innovative ways to maximize our capabilities, and prepare to ride yet another bow-wave of change, we can look back to our predecessors for a bit of guidance. In the dark days of The Big Cut, when the RCAF was "entirely shot to pieces,"¹ the outcome was unexpected. As it turned out, "paradoxically, ... as funds declined, defence analyses became sharper, distilled to their bare essentials. And the RCAF found itself taking on the central responsibility for Canada's home defence."² There is no doubt that as we move further into the second decade of the 21st century, the RCAF will, as it did in the 1930s, remain at the forefront of Canadian defence. 🇨🇦

"Plus ça change, plus c'est pareil!"



Major William March, CD, MA
Senior Editor

1. W. A. B. Douglas, *The Creation of a National Air Force, Volume II, The Official History of the RCAF* (Toronto: University of Toronto Press, 1986), 125.

2. Ibid.

LETTERS TO THE EDITOR

Dear Editor:

As always during the Christmas season, in the one just past, my wife Jacquie and I welcomed the many Christmas cards that come to our door. Some offer the sole contact of the year received from a distant relative or old friend. As has been my custom, I also take note of the stamps on the envelopes.



Canada Post issues a surprising variety of stamps and many relate to significant events. This year I made a unique discovery. On one envelope that we received, I could not help but notice a stamp that carried a clear picture of the shoulder of a search and rescue technician (SAR Tech) with a sergeant rank badge slip-on and a Canada flag patch on the distinctive orange SAR Tech uniform. In the background are what appear to be rough seas and a vessel. It brought to mind the amazing commitment and work done by our SAR Techs in uniform across the country.



Even more surprising, though, was another envelope that we received, the stamp of which showed the shoulder of a Canadian Forces (CF) member wearing CADPAT (our green Canadian disruptive pattern uniform), again with the Canadian flag patch prominently displayed. The background this time showed a helicopter with a slung load in a tropical area with a couple of individuals watching. This image immediately brought to mind the CF's contribution to Operation HESTIA

(OP HESTIA), the impressively rapid Canadian humanitarian response to the tragic earthquake in Haiti.

My stamp discoveries prompted me to do some online investigation revealing that Canada Post had actually issued a set of five stamps depicting "Canadian Pride." These stamps focused on depicting the Canadian flag in many areas. In addition to the flag shown on the Canadian soldier's CADPAT and the SAR Tech's uniform, the other designs included our flag on a traveller's backpack, on a hot air balloon, and on the famous Canadarm.

I was not aware of any special announcement regarding the issue of these stamps, but I thought it was worthwhile now to point them out. This silent recognition certainly illustrates the tremendous pride of our nation in our CF members who serve their country, and I, for one, was very pleased to see it. They say that a picture is worth a thousand words, so please have a look at the picture of the two stamps we received on our holiday mail and see if they do not give you a great sense of pride as well.

Chief Warrant Officer (CWO)
J. W. (Bill) Dalke, CD
2 Canadian Air Division CWO



Sir:

I just wanted to say “Thank you!!” to both you and Major Thorne: first, to Major Thorne for his research on this topic; and secondly, to you for publishing this article [see “Exposing the True Cost of Distance Education” by Major Thorne in *The Canadian Air Force Journal*, Summer 2011, Vol. 4, No. 3]. I am one of those members who is currently going through this situation (distance education), and this article brings credence to what I have been trying to explain to others for some time.

Cheers!

Captain Sean F. P. Abrahams
Air Combat Systems Officer (ACSO)

Dear Editor:

Lieutenant-Colonel Murray’s article, “What Air Forces Do” (*Canadian Air Force Journal*, Vol. 4, No. 4), was meticulously researched, eloquently presented, and clearly written. What is still up in the air from a terminology perspective is whether the four core air power “things” are functions, capabilities, or roles. This remains to be decided, as the definitions for each are still being hotly debated at the joint level (but expected to be resolved in 2012). Notwithstanding all of the above, the four core air power categories, learned from a century of air warfare, are not static, unchanging, and inviolable. In fact, there is a new kid on the block to contend with, experienced and reinforced only in the last 70 years. In addition to “control of the air, movement of things through the air, observation of things from the air and space, and when necessary, attacking things from

the air,”¹ the concept of recovering isolated personnel and/or personnel in distress is now recognized as fundamental to what an air force does. Unless we do this, the sustainment of our combat capability—not to mention the second order effect it has on the nation—is compromised. Our neighbour to the south has recognized this fact by elevating personnel recovery to the status of a “service core function,” as conveyed in the recent publication, *USAF Air and Space Power Journal*, Fall 2011. What might cloud the issue for some is that personnel recovery is no longer considered a pure air force capability—in some countries it is typically classified as joint, but in Canada it is classified as “integrated,” that is, whole-of-government. Nevertheless, the majority of combat search and rescue (CSAR) clients are still isolated aircrew, and the Air Force is still the lead agent in effecting the means of recovery. The Royal Canadian Air Force (RCAF) acknowledges this fact. Canada may not have an organic CSAR role (yet), but its inclusion in RCAF doctrine underscores what we hold to be true, not what capabilities and roles we have in our inventory. If harmonization with our closest ally is a consideration, it is time to acknowledge officially—in doctrine and RCAF Vectors—that personnel recovery has passed the litmus test of being fundamental to what an air force does.

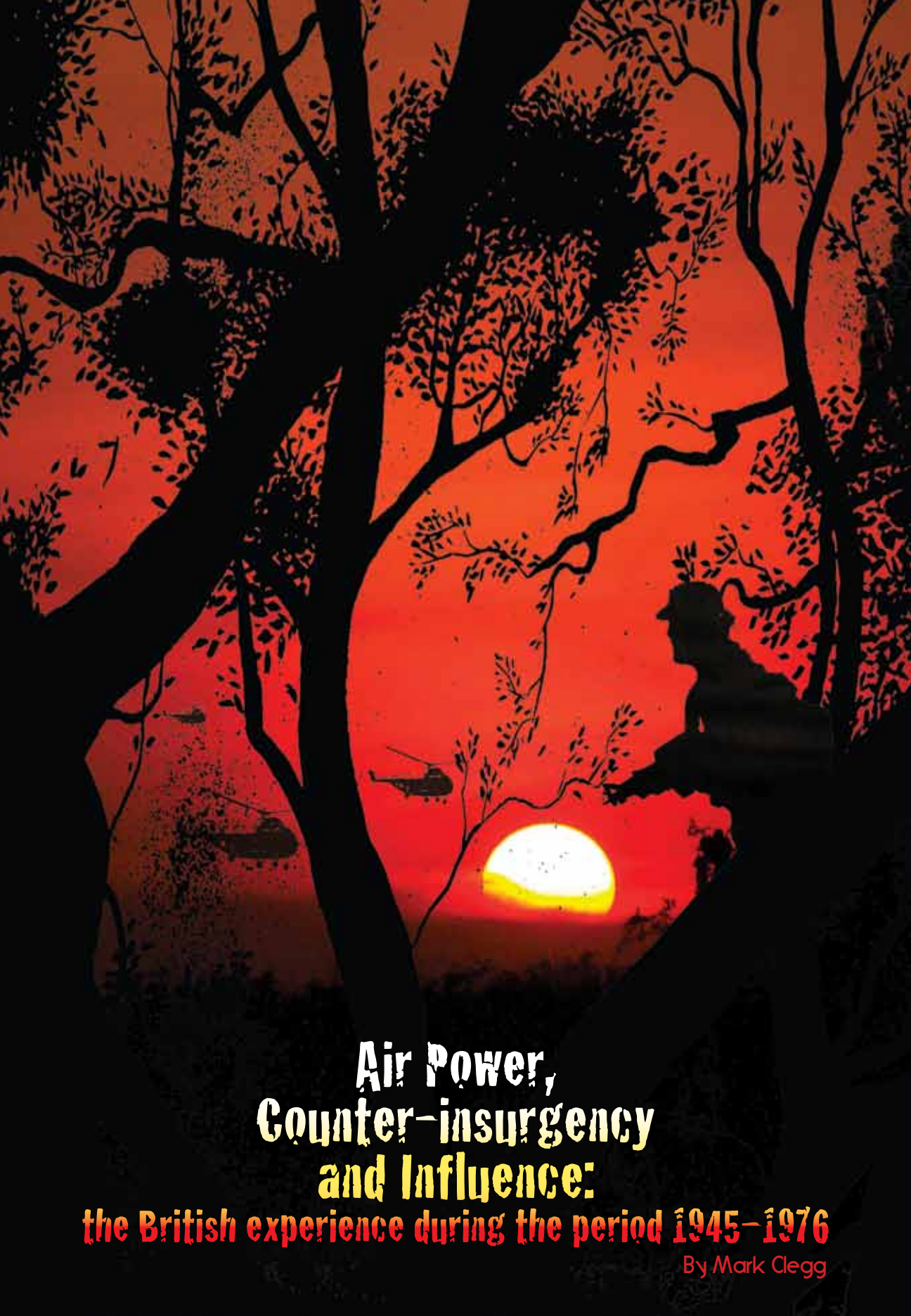
Major James R. Bound
Doctrine Development
Canadian Forces Aerospace Warfare Centre

NOTE

1. Brian L. Murray, “What Air Forces Do,” *Royal Canadian Air Force Journal* 4, no. 4 (Fall 2011): 45.

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**Air Power,
Counter-insurgency
and Influence:**

the British experience during the period 1945-1976

By Mark Clegg

The views expressed in this essay are those of the author and do not necessarily reflect the official policy or position of the Ministry of Defence of the United Kingdom, the Royal Air Force or any other government agency, nor of the Government of Canada and the Canadian Forces.

Central to counter-insurgency (COIN) operations is the notion of influence, which is defined in United Kingdom (UK) doctrine as: “The power or ability to affect someone’s beliefs or actions; or a person or thing with such ability or power.”¹ Influence is a product of all military activity. The audiences to be influenced are numerous, including the adversary, the officials of the target state, holders of opinion on the international stage, and the domestic electorate.² Conducting influence is a complex task, but provides significant advantage. British doctrine describes influence as a contest which the adversary is likely to go to great lengths to win. Outgunned in conventional terms, adversary focus of attention will likely shift to influencing selected opinions, fighting “in a virtual battle space of ideas.”³ There is a paradox surrounding kinetic attacks, known as “propaganda of the deed,” within an influence campaign. For the insurgent, prosecuting successful attacks against us gains credibility and reinforces his support base. However, our military attacks against adversarial targets represent short-term tactical success that is often transcended by longer-term, negative effects such as reinforcing support for the insurgent cause.⁴ Such second-order effects can be the by-product of well-intentioned activity. Nevertheless, tragedies such as civilian deaths are routinely exploited in insurgent messaging and have the potential to undermine our own domestic support base. Even so, air power can provide decisive effect in COIN operations. For instance, air mobility “provides significant asymmetric advantage to [COIN] forces, enabling commanders to rapidly deploy, sustain and reposition land forces throughout the theatre.”⁵ Furthermore, aeromedical evacuation attends to both the physical and morale

component during COIN; it serves to extract and treat wounded troops, but also provides an assurance for other servicemen, underpinning morale, as well as assuaging the concerns of the domestic electorate.⁶ This paper will demonstrate that air power has played a pivotal role in influencing audiences during historical British COIN campaigns. Illustrative examples will be drawn from Malaya, Aden, and Dhofar, and will include activity which has influenced the British effort beneficially as well as detrimentally. Finally, enduring lessons will be drawn from the period outlined, and their relevance will be mapped to contemporary operations.

The Malayan Emergency of 1948–1960 comprised the Malayan Races People’s Liberation Army, an insurgent group which aspired to independence. The jungle terrain that greeted British troops in Malaya was particularly difficult to traverse. A mountainous landscape climbing to around 7000 feet (2140 metres [m]), tree-top canopies reaching 150 feet (46 m), and entangling secondary jungle, with temperatures exceeding 90 degrees Fahrenheit (32 Celsius), all made it a challenging operating environment for UK forces.⁷ Perceptions of the role that the Royal Air Force (RAF) played in overcoming such an environment are mixed. J. Newsinger, in his book, *British Counter-insurgency: From Palestine to Northern Ireland*, disregarded the RAF’s contribution to success in Malaya by stating that “[o]ne factor that was of little importance in the conflict was air power.”⁸ For him, “air power” encapsulated nothing beyond traditional bombing operations. However, early on in the Malayan campaign, the British hierarchy dictated that minimum force would be a central theme running through the UK approach to COIN; inextricably linked to this decision was to be a restriction on the kinetic natures of air power.⁹ Notwithstanding such constraints, the evolution, adaptability, and agility of air power evidenced a far greater contribution from the RAF to the Malayan campaign.

Routine activity was greatly assisted by the advent of helicopters into operations as the Sikorsky S-55, S-51 and Westland Whirlwind variants were introduced into the jungle. Patrols were subsequently able to cover larger areas and maintain the initiative against their adversaries. As well as routine transit assistance, helicopters engaged in casualty evacuation tasks for British troops. Jordan explained that, notwithstanding limitations resulting from payload capacities and climatic conditions, helicopter assistance negated laborious treks through the jungle, which would have otherwise involved carrying casualties on stretchers. The benefit of aeromedical evacuation by helicopter in Malaya was significant, totalling approximately 5000 evacuations by the end of the campaign. Importantly, the speed of evacuation meant that recovery was quicker, not to mention being accomplished at all in some otherwise impossible situations. Consequently, “casualty

evacuation by air became a vital component in operations.”¹⁰ However, this was more than an improvement in the tactical dimension of the Malayan campaign. Such an evolution was a significant ease on commanders’ planning considerations; no longer would they be required to commit large teams to evacuate casualties. Profoundly, troops embarking on patrols had an assurance that their chances of survival if injured were greatly enhanced. Thus, the influence effect of aeromedical evacuation underpinned the morale component of the Army’s fighting power.

An added benefit to the RAF’s aeromedical evacuation capability was its utility to assist injured civilians. British medics operating within patrols would treat civilian casualties, and, when required, would arrange for extraction to more comprehensive care by RAF helicopter. Jordan linked this activity to the famous “hearts and minds”



PD Photo: Imperial War Museum

approach being employed by the British at the time.¹¹ General Sir Gerald Templer, High Commissioner and Director of Operations from 1952, described the Malayan campaign in terms of a psychological battle, arguing that “the shooting side of the business is only 25 per cent of the trouble and the other 75 per cent lies in getting the people of this country behind us.”¹² He perceived the campaign as a competition for the consent of the people, which hinged upon provision of security in the broadest terms. Therefore, the benefit of aeromedical evacuation, allied to the important task of extracting wounded soldiers from the battlefield, provided considerable advantageous effects. This nascent air power capability, when applied to civilian casualties, was central to how Templer defined campaign success. Fundamentally, air power was used to prosecute an influence campaign with people at its heart. The question was whether the British would be able to repeat such a successful campaign using air power in a COIN environment in future operations.

Contrasting the successful prosecution of widely welcomed jungle aeromedical evacuation activities in the Malayan Emergency was the Aden campaign that began in the early 1960s. Aden was a strategically important location for Britain due largely to its proximity to the Suez Canal and key Arabian states. Nevertheless, this importance had been unmatched by British investment in the region, resulting in an unsettled populace. Security in Aden had thus far been enforced through the “Air Control Scheme”; a system whereby air power, predominantly kinetic attacks, was used to discipline tribes which had defied British authority.¹³

In 1964, British troops were deployed to the Radfan region to confront the threat posed by two insurgent groups: the National Liberation Front and the Front for the Liberation of South Yemen. The region was described as almost untouched by the twentieth century. Mountainous and seemingly

inaccessible, the Radfan was perceived as vital ground and was to be occupied by British forces. Air power proved invaluable as helicopters ferried troops and equipment in a bid to gain the high ground.¹⁴ The role of helicopters in delivering supplies remained important throughout the campaign, but attacks from the air were also of particular significance to the British effort. Indeed, some argue that the utility of air power in neutralizing insurgent attacks reduced the ground footprint of UK troops and thereby prevented escalating casualty figures, mitigating any associated political and public backlash.¹⁵ However, the use of air power at Radfan was not confined to its positive effect. The RAF conducted activity at the heart of the “ground proscription” strategy. The aims of ground proscription were:

- to make life so unpleasant for the tribes that their morale is broken and they submit; and
- to draw them into a militarily unfavourable position so that we could inflict heavy casualties.¹⁶

All sign of human activity in the proscribed areas was subjected to attack, including strafing and rocket fire. Moreover, “[t]heir crops were destroyed ... and their houses blown up.” The attacks were comprehensive, with Hunter jets expending “2508 rockets and nearly 200,000 cannon rounds, while the Shackleton bombers dropped 3,504 20-lb [pound / 9-kilogram] anti-personnel bombs and 14 1000-lb [454-kilogram] bombs and fired nearly 20,000 cannon rounds.”¹⁷ This approach was perceived by some as akin to a colonial era strategy for dealing with “tribal resistance,” when in fact what was in train was an insurgency. Clausewitz posited the fundamental strategic question: “The first, the supreme, the most far-reaching act of judgement that the statesman and commander have to make is to establish ... the kind of war on which they are embarking; neither mistaking it for, nor trying to turn it into, something



that is alien to its nature.”¹⁸ Aiming to starve the insurgents into submission, the result of ground proscription was to drive the insurgents underground. The short-term result was assessed as a victory militarily. In terms of influence operations, the first-order effect, although possibly unpalatable to 21st century readers, achieved a first-level order of military success inasmuch as insurgent activity appeared to dissipate. However, the British strategy was unsupported by similar political energies necessary for more permanent stability.¹⁹ Furthermore, such tactics were out of step with international opinion.

Crucially, air operations had served to dislocate insurgents who consequently established bases elsewhere. Additionally, planning was conducted without consideration for the likely reaction of the various audiences. The British public were highly critical of the use of air power to conduct bombardment in order to proscribe areas. Such tactics were perceived as not in tune with the British way in warfare.²⁰ Influence should have been at the heart of the Aden campaign, not least because the perceptions of surrounding oil-producing states such as Saudi Arabia were strategically important to Britain.²¹ Air power scholars, such as Kemsley, remind us of the psychological effect that air power can have on an adversary. He argued that within the context of COIN, air power can be used to affect both “constructive and destructive” action. The fundamental difference between these actions “is said to be dependent upon the effect desired *after* the operation is completed.”²² Described by some as a British equivalent of the American failure in Vietnam, the Radfan campaign was widely criticized both at home and abroad including by the United Nations (UN) General Assembly.²³ The British use of air power in Aden can be assessed as destructive as it contradicted long-term aims and contrasted with wider opinion. The use of air power in Aden did achieve influence; but not positively in a way conducive to long-term stability in the region or in a way to enhance

Britain’s geo-strategic reputation on the world stage. Fundamentally, the use of air power was at the heart of the UK failure as it was the vehicle by which Britain’s approach to the conflict was epitomized in the eyes of the various audiences.

Three years after the Aden debacle, the British were involved in another COIN campaign as the Sultan’s Armed Forces of Oman were unable to deal with a growing insurgency. In 1970, a small British unit, including Special Air Service (SAS) troops, was dispatched to Dhofar to assist with the deteriorating security situation that some argued found its origins in the British failure in Aden just a few years earlier. The strategic importance of Dhofar was assessed as acute, as the rising insurgency was perceived as representing the threat of expanding Communism in the entire region.²⁴ One particular battle within the Dhofar campaign evidenced the advantage of air power as an agent of influence within a COIN environment.

The morning of 19 July 1972 saw a massed insurgent assault upon SAS positions, including the gendarme fort of Mirbat. Cloud cover initially prevented the Britons from receiving air support while the insurgents were aided by mortar and artillery fire from a mountainous feature known as the “Jebel.” Even when the SAS troops appeared to have stifled the attack, the rebel’s advance continued. However, as the weather improved, British air power was launched and was able to affect the balance of the fighting. Close air support from Strikemaster aircraft conducted rocket and cannon fire attacks on the advancing insurgents, and SAS reinforcements were brought in by helicopter to bolster defences. This interjection of air power worked to repel the insurgent attack. Second-order effects were achieved as the success was communicated to the civilian population of the capital, Salalah. The perceived legitimacy of the Sultan was thereby strengthened as he had been seen as restoring law and order. Longer-term

stability was achieved in part by the work of the civil aid teams, which were able to provide the social functions required to satisfy the needs of the population. Schools and medical facilities were among the improvements that ensuring security in the region facilitated.²⁵

The role of British air power in July 1972 was central to an operation that provided the necessary security for subsequent stability measures to be implemented and thus achieve strategic objectives. Newsinger argued that the tactical victory achieved by a combination of British Special Forces and air power was transcended by the more profound benefits of success. He linked the performance with the wider narrative of Britain's performance in pivotal world events, a continuation of imperial performance which outlived expectations.²⁶ In so doing, British air power contributed to influence on the grandest scales, whereby second- and third-order effects far surpassed the not insignificant first-order effects. Furthermore, air power's utility in Dhofar provided a historical referent against which to measure the efficacy of air power on current operations.

In attempting to highlight contemporary relevance to the historical lessons of air power's role in influence within COIN operations, we find that themes do exist. "The People" are consistently highlighted as the key battleground within COIN campaigns. Kitson argued that "[t]here has never been much doubt that the main characteristic which distinguishes campaigns of insurgency from other forms of war is that they are primarily concerned with the struggle for men's minds."²⁷ The contemporary operating environment is such that influence remains a dominant characteristic of warfare, and thus must be a paramount consideration within our planning. Indeed, commanders must "develop coherent and comprehensive plans to specifically defeat the insurgent in the virtual world as well as in the physical domain."²⁸ Implicit is the need to understand the nature

of the contemporary operating environment. Widely accessible, 24-hour media coverage with accompanying permanent scrutiny is just one dimension that offers challenges as well as opportunities for air power. The accessibility by which UK audiences receive images of ongoing operations in Afghanistan is much enhanced by experiences in Malaya in the 1950s, and so the public is far more aware of the nature of activity in which British troops are engaged. Accordingly, effective influence activity is pivotal in achieving success in COIN environments, and recent history has provided us with examples of how air power has contributed. In distilling the three experiences highlighted above, the first lesson is that, although all tactical activity *influences*, the nature of air power intensifies its potential for influence. Whether it be the impact of the advent of aeromedical evacuation or the ground attacks as part of a ground proscription mission, the influence message is powerful. Intended or not, audiences will be influenced by air power.

The effect of air mobility on ground troops is a significant enabler to COIN operations. It assists with traversing difficult and dangerous terrain, and crucially, facilitates physical links between counter-insurgent and civilian. On all levels, this action thwarts the insurgents' own influence campaign. Furthermore, helicopter support on current operations serves, *inter alia*, to distance troops from the improvised explosive device threat while maintaining the



PD Photo

operational focus on securing the support of the population. The dominant COIN narrative prescribes a ratio of 20 counter-insurgents to every 1000 members of the civilian population.²⁹ However, pressures on troop numbers frequently result in deployments falling far short of this ideal; helicopter support serves to attempt to neutralize this shortfall by complementing ground troops with mobility. Air mobility also nurtures the morale component of our forces as it provides evidence of higher support and concern for the welfare of soldiers. Moreover, domestic support for the COIN campaign is strengthened by such capabilities. Indeed, the discourse surrounding air mobility assets to the current campaign in Afghanistan is frequently used by the British media to measure the level of political commitment to the operation.

Aggressive use of kinetic attack to deny areas to insurgents in Aden was perceived as an anachronistic strategy even in the 1960s. Even though such attacks were directed at a specific tactical goal, they resulted in a significant level of unintended consequences. Not only did they serve to alienate the target population from the UK deployment, but they also undermined vital wider international support for the campaign. Currently in Afghanistan, such attacks are perceived as disproportionate by many, and any interpretation of excessive force becomes ammunition for the insurgents' own influence campaign. A more acceptable use of air power to deny insurgent activity over recent operations has been non-kinetic shows of force. Such tactics allow the benefits of timely presence to disperse insurgent activity; this has been proven on recent operations where insurgents have learned to associate the presence of aircraft with an imminent attack on their locations. Clearly, the danger exists that solely using shows of force would similarly programme the insurgent with the message that we are unprepared to conduct kinetic attacks. Therefore, a balance must be struck whereby kinetic attacks are prosecuted sparingly. Such a measured approach satisfies

the need to neutralize insurgent aggression, bolster the confidence of the civilian populace, and acknowledges the desire for restraint from domestic audiences. Moreover, such courageous restraint is coherent with the intent of higher command in theatre.³⁰

Notwithstanding the potential negative impact of excessive use of force, there are occasions when the desired effect calls for kinetic action. Importantly, such operations in Dhofar demonstrated effect far beyond tactical utility, crucial though it was. Close air support of ground troops can be a "contact" winner, can shatter the insurgents' cohesion, and will and can illustrate resolve to the civilian populace with absolute clarity. Moreover, it can enable the necessary security climate within which political and social reconstruction can occur. Additionally, close air support in COIN works at the tactical level by providing visible evidence of joint action and underpinning the morale component of the fighting force. These three historical examples have illustrated that success within the influence battle is underpinned by cohesion in joint operations. Jordan argued that such "jointery" as part of a wider comprehensive approach is key to defeating insurgencies.³¹ Furthermore, these examples, together with experiences on contemporary operations, have amplified the need to understand the environment within which air power is employed. Thus, the role of intelligence gathering and overall situational awareness³² ought to be seen as a *sine qua non* for COIN operations.



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In conclusion, this paper has sought to examine the effectiveness of air power in British COIN operations in Malaya, Aden, and Dhofar. It has conducted this task through a lens of influence, acknowledging that air power was a significant tool with the potential to achieve much within the influence battle. The Malayan Emergency witnessed air power's role in influence operations as the advent of aeromedical evacuation greatly enhanced the British performance. The campaign was a success as the role of air power played a central role in complementing the "hearts and minds" approach. Influence underpinned all helicopter activity, as troops, civilians, the British public, and the insurgents drew their conclusions from the air power supported insertion of British forces into the Malayan jungles. Unfortunately, the role of air power in the Aden campaign was at the heart of British influence activity, which ultimately prevented success. By using aggressive kinetic tactics to deny ground, the British cause was weakened and support was lost. However, UK experience in Dhofar demonstrated that kinetic action did have a decisive role in the influence dimension of COIN. Influence activity pervades all natures of warfare, but is particularly crucial in COIN campaigns, which are judged as battles ultimately concerned with the minds of populations. Air power has a key role to play in what is considered the overriding priority, on which success rests, in the current International Security Assistance Force (ISAF) operation in Afghanistan:

Think of COIN as an argument to earn the support of the people. It is a contest to influence the real and very practical calculations on the part of the people about which side to support. Every action, reaction, failure to act and all that is said and done becomes part of the debate. The people in the audience watch, listen and make rational choices based on who can better protect them, provide for their needs, respect their dignity and their community and offer opportunities for the future.³³

British air power has produced effects which have led to mixed results since experiences in Malaya. Recent historical experiences provide references, which, when applied in context, offer enduring frameworks for the utility of air power in COIN influence activity in the contemporary operating environment. Such influence activity has been proven to be indispensable, rather than optional, during COIN campaigns. Influence is fundamental to winning the consent of audiences, in particular the civilian population, and air power has a major role to play in such environments. 🇬🇧

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Abbreviations

COIN	counter-insurgency
RAF	Royal Air Force
SAS	Special Air Service
UK	United Kingdom

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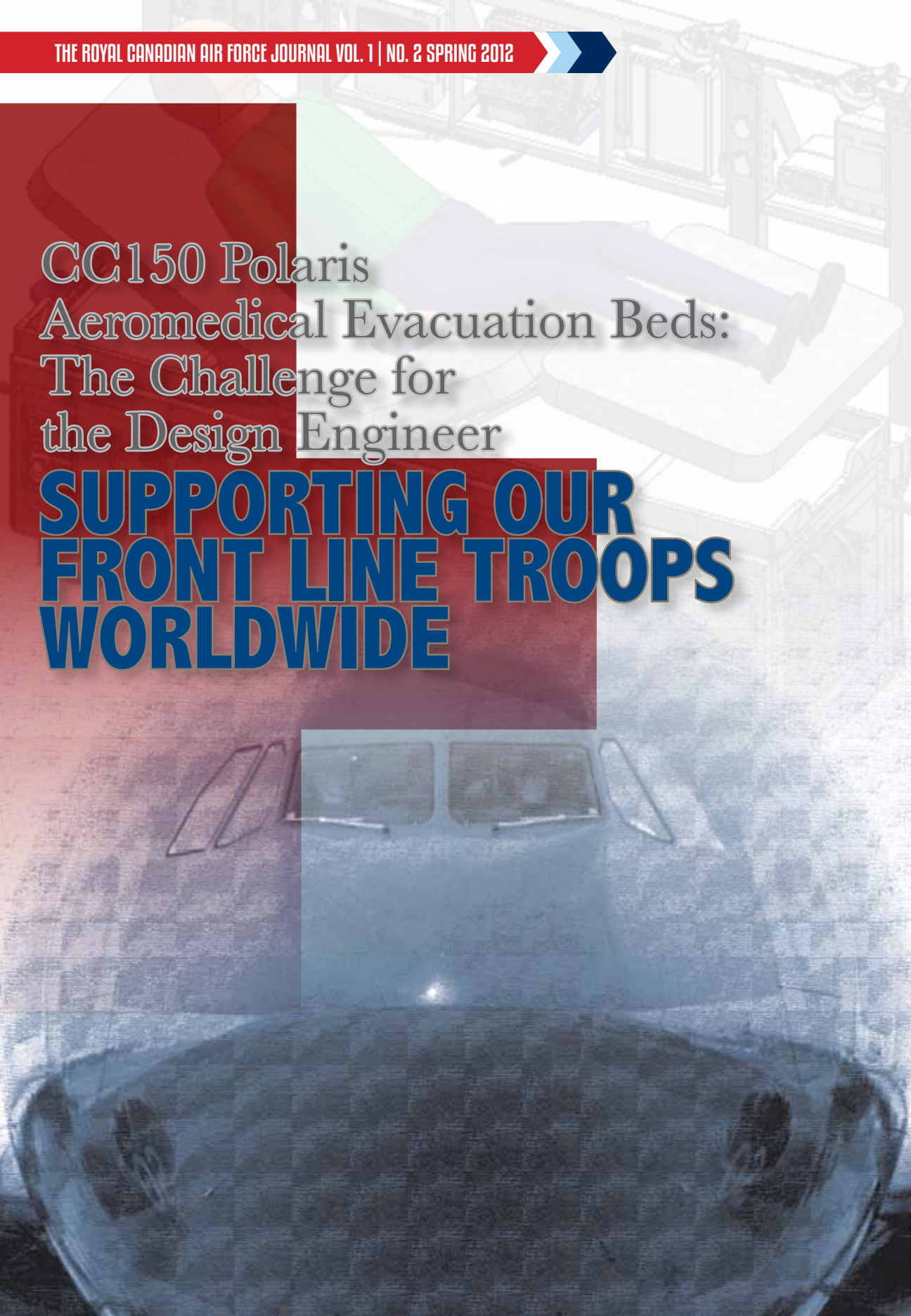
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CC150 Polaris
Aeromedical Evacuation Beds:
The Challenge for
the Design Engineer

**SUPPORTING OUR
FRONT LINE TROOPS
WORLDWIDE**



By David Smith,
Major Dominique Laplante, and
Captain Sophie Lavoie

INTRODUCTION

One of the most important of the many roles of the CC150 Polaris aircraft of the Royal Canadian Air Force (RCAF) is that of aeromedical evacuation (AE). This task involves the safe transport of injured and ill personnel from foreign or domestic locations to Canadian or other westernized medical treatment facilities for continued care. To accomplish these AE missions, the RCAF has historically used patient transport units (PTUs), also known as AE or MEDEVAC beds.

Based on over a decade of AE missions throughout the world, the RCAF's Aeromedical Evacuation Crew Members (AECMs) have noted deficiencies in the current PTUs used within the Polaris fleet. While these AE beds have served their purpose with distinction and great effect over the last 14 years, the significant increase in the medical acuity of our personnel being airlifted meant these beds were no longer suited for long transfers. This led the AE community to request a revisit to the design of the MEDEVAC beds to meet the needs of both Canadian personnel and the AE community.

The purpose of this article is to describe the design process adopted for the new AE beds, taking into account not only the needs of the AE community, but also the considerations given to maintaining technical and operational airworthiness of the CC150 fleet. The article also discusses some of the practicalities of accessing the aircraft, including loading and unloading the beds and patients in the wide and diverse conditions the Canadian Forces (CF) encounter.

FLEET OVERVIEW

The RCAF operates a total of five CC150 aircraft, maintained by Aveos under a Public Works and Government Services Canada

(PWGSC) contract. Aveos is responsible for all aspects of maintenance, airworthiness, and configuration control of the aircraft through Director Aerospace Equipment Programme Management (Transport and Helicopter) DAEPMTH and is co-located with 437 Squadron at 8 Wing Trenton.

Aveos was tasked by DAEPMTH to select a contractor to design and manufacture a suite of new AE beds for use on the CC150 Polaris aircraft. LifePort Inc, a Sikorsky Aerospace Services company, has been assigned this contract.

The Airbus A310 aircraft (see this page) is a wide-body, twin-engine, low-wing monoplane with a pressurized fuselage and normal configuration tail. All five aircraft were manufactured by Airbus Industries in approximately 1986 and hold a Transport Canada (TC) Approved Type Design Certificate. The aircraft were bought by the Department of National Defence (DND) around 1992, and brought into service with 437 Squadron over the following three years. Two of the aircraft—tail numbers 15002 and 15003—are designated for aeromedical evacuation use, although other aircraft from the fleet could be configured with AE beds if required.



A CC150 Polaris aircraft, bought from Canadian Airlines

The PTUs are permanently stored at 8 Wing to ensure quick reconfiguration of the aircraft and subsequent deployment on AE missions. Storage is always an ongoing challenge at Canadian Forces Base (CFB) Trenton, partly because the entire 8 Wing is currently undergoing a revamp of their base facilities to accommodate the growing and changing space needs of several fleets. Provision of an appropriate location is important for long-term storage of the beds to ensure they are safe from damage and environmental degradation. Designers must be mindful of these challenges.

Wide-body? A wide-body aircraft is also known as a twin-aisle aircraft. The typical fuselage diameter of a wide-body aircraft is from five to six metres. In the typical wide-body economy cabin, passengers are seated 7 to 10 abreast, allowing a total capacity of 200 to 850 passengers.

DESIGN REQUIREMENTS

Overview

The high-level specification requirements for the AE bed can be summarized as follows:

- provide increased patient comfort for the duration of AE missions by establishing a more ergonomically friendly design;
- increase the ability of the AE team to deliver care to various type of patients, including critical care patients, for flight durations of up to several hours;
- take into consideration the needs of various stakeholders involved with AE missions, including medical staff, Aveos maintainers, CFB Trenton personnel, and 437 Squadron flight crew; and
- design for various loading and unloading scenarios to ensure aircraft can be quickly and efficiently evacuated as required.

It is essential for the designer to develop an AE bed solution that will ensure the best possible delivery of care while in flight. The designer must customize every aspect of the AE beds to ensure maximum efficiency—from the dimensions of the bed mattress to the type and locations of medical mounts, storage provisions and overall envelope. Simple, right?

Size and comfort

High on the list of areas for improvement for the new AE bed is the requirement to improve its size and comfort. Space on aircraft is always at a premium, and so one of the challenges for the design engineer is to make efficient use of every single inch. The initial design of the AE bed provided a width of approximately 18 inches (0.46 metres). Considering anthropometric measurements—the 99th percentile male model—and the space requirements to properly support injured limbs and external bracing for fractures, it was evident that the width and length of the proposed design were not suitable. In addition, the thickness of the mattress on the current PTU was insufficient to provide adequate comfort to the patients. The mattress must be designed to provide optimal protection from pressure-ulcer-formation risk inherent to lengthy missions.

One more challenge for the designer was the height of the AE bed. The currently used PTUs force the medical staff to stoop for extended periods of time, thus increasing the chance for injury and workplace discomfort.

MIL-STD-1472 Design Criteria Standard: Human Engineering is used as a reference guide by engineers to establish design criteria for key dimensions of the AE beds. This standard contains extensive tabulations of the height and weight of 95 per cent of all male and female troops ... hence the commonly used term “95th percentile” (see <https://assist.daps.dla.mil>).

Equipment placement

A modern AE bed is a lot more than just a place for a patient to lie down. It is a site for a host of highly technological medical equipment, such as cardiac monitor/defibrillator, vital signs monitor, ventilator, intravenous solution administration pump, oxygen source delivery system, and suction pumps. All of the equipment needs to be safely mounted and readily accessible during flight.

The currently used PTUs have embedded oxygen and suction capabilities; however, there is limited space to secure the medical equipment accompanying the patient. Therefore, the designer must consider equipment placement with regard to accessibility and visualization of the various display screens.

The new AE bed will provide an increased source of medical graded oxygen (the previous bed provided 6,274 litres; the new bed will provide 10,500 litres).

Aircraft access

As the CC150 Polaris aircraft is a wide-body aircraft, the forward cabin area has been modified to accommodate up to five new AE beds. Loading and unloading the aircraft at departure time can be quite congested (see photo this page); therefore, loading these new beds on-board the aircraft presents considerable design challenges. For example, as per the proposed AE bed design, the base unit weighs over 200 pounds (91 kilograms) and must be lifted to the height of the passenger door by means of a scissor-lift table and then manually two-person manoeuvred into position in its cabin location. Care must be taken to avoid damage to the AE beds or to the aircraft. The lighter and smaller the base unit the better, which is another factor for the design engineer to consider.

How is emergency evacuation affected? The installation of the LifePort AE beds requires modification to the configuration of the forward cabin, which in turn presents

challenges due to reduced access to the forward passenger doors. This reduction in access affects the emergency evacuation, as patients on the AE beds may require additional time and assistance to evacuate the aircraft, due to their medical condition. There also exists the possibility that the patient and attending AECMs will not be able to exit the aircraft within the 90-second time frame. As such, the designer has to give careful consideration to the ease with which the patient can be removed off the bed, with minimal restrictions resulting from restraint harnesses and securing straps.



Access to the Polaris aircraft can be a hectic and busy place as seen on this cargo load

DESIGN IN PROGRESS

Now that we have identified many of the factors the design engineer must take into account, how have these factors been addressed in the new design?

Canadian Aviation Regulation (CAR) Airworthiness Manual (AWM) 525.803 (c) Emergency Evacuation states: "For aeroplanes having a seating capacity of more than 44 passengers, it must be shown that the maximum seating capacity, including the number of crew members required by the operating rules for which certification is requested, can be evacuated from the aeroplane to the ground under simulated emergency conditions within 90 seconds" (see <http://www.tc.gc.ca>).

After considerable early evaluations and assessments, it was decided to design the AE beds based on up to five being installed on the aircraft at any one time. Each AE bed is significantly larger than the previous PTU, and as a result of the larger size, five new beds will use the space previously occupied by six older models. The beds are designed for quick removal and easy re-installation between missions.

The LifePort conceptual design of the AE bed consists of three separate yet fully integrated components—the equipment arch, the PLUS base, and the MedBed (see Figure 1). When installed on the aircraft, the AE bed must be a fully integrated system certified for use during all aspects of flight.

capacity has been increased from 6,274 litres from the currently used PTU to 10,500 litres. Oxygen is stored in cylinder bottles easily accessible for removal to be serviced outside the aircraft. The base contains a frequency converter and an AC to DC (alternating current to direct current) power converter for all DC appliances. The frequency conversion is from 115VAC (voltage alternating current), 3-Phase, 400Hz (hertz) to 115VAC, single phase, 60Hz. Air and suction pumps, a lockable drug storage drawer, and a sharp container drawer are also included. The PLUS base is designed to install directly to the existing aircraft seat track without the need for special tools, using an interface mounting system.

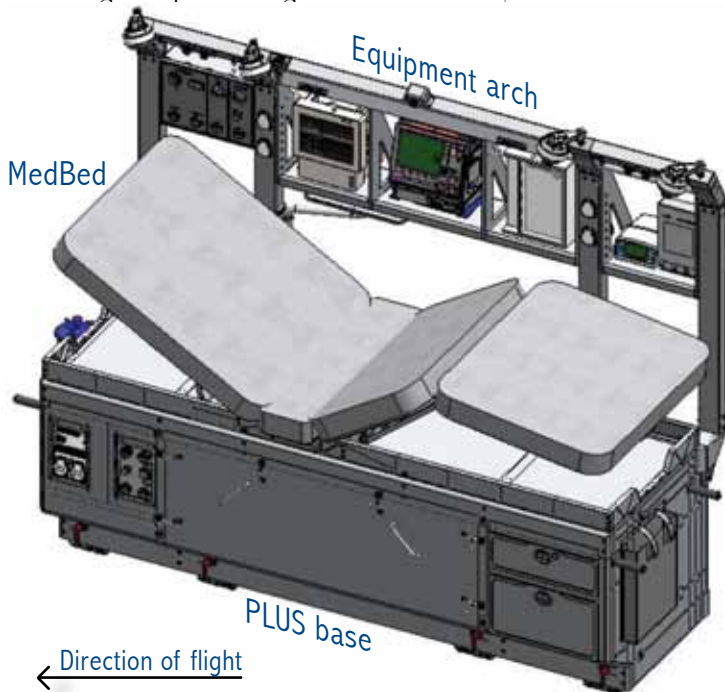


Figure 1. Three major components of the new MEDEVAC bed: PLUS base, equipment arch, and MedBed

PLUS base

The PLUS base provides oxygen, air, suction, electrical outlets, and storage compartments. The medical graded oxygen storage

Equipment arch

The equipment arch is designed to support all required ancillary medical equipment and payloads, and to improve visualization of the various screen displays. It also includes a track light system of adjustable intensity, oxygen, air, suction, and electrical outlets. The equipment arch is supplied services from the PLUS base, and can be accessed at the height of the patient.

MedBed

The MedBed is removable from the PLUS base for installation and cleaning. The MedBed is articulated to enhance patient comfort, and includes adjustable upper body and knee lifts, as well as a 3-inch (8-centimetre) thick foam mattress (see Figure 2). The MedBed is structurally

substantiated for carrying a 300-pound (136-kilogram) occupant flying in two configurations: head forward or feet forward. Patients will be secured via a five-point restraint harness and a thigh strap.



Figure 2. Conceptual MEDEVAC bed design showing patient

CONCLUSION

Design of a fully functional and effective AE bed for modern-day military deployments is a considerable challenge for the design engineer. Consideration must be given to a wide range of factors: the needs of the AE community as it fulfill its obligation to deliver high-quality care; the design challenges to provide an efficient AE bed solution in a weight- and size-constrained aircraft where all available space must be used effectively; and the needs of the modern partnership of aircraft operators and maintainers. The current plan is to bring the AE beds into service in fall 2012. All in all, the challenges are considerable, but DND feels confident that these challenges are being met with careful and diligent attention to detail. 📍

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Captain Sophie Lavoie joined the CF in 2004 and completed her Bachelor of Science in Nursing through Regular Officer Training Plan (ROTP) at Lakehead University. She has been a flight nurse with the Canadian Forces Aeromedical Evacuation Flight since September 2009. She is proud and honoured to be able to care for and assist in the return of injured troops from wherever they may be.

David Smith joined DND as Deputy Aircraft Engineering Officer, DGAEPM(TH), in early 2011. David brings to DND over 30 years' experience in a wide and diverse range of industries, including nuclear, steel, high-tech, and military in England, New Zealand, and Canada. His experience is augmented by formal qualifications in both electrical and mechanical engineering (Leeds University) as well as an MBA from Ottawa University.

ABBREVIATIONS

AC	alternating current
AE	aeromedical evacuation
AECM	Aeromedical Evacuation Crew Member
CF	Canadian Forces
CFB	Canadian Forces Base
DAEPMTH	Director Aerospace Equipment Programme (Transport and Helicopter)
DC	direct current
DND	Department of National Defence
Hz	hertz
PTU	patient transport unit
RCAF	Royal Canadian Air Force
VAC	voltage alternating current

What was the Primary Reason for the Collapse of the French Air Force in 1940?

By Colin Gilmour



For many years the prevailing explanation for the collapse of France in 1940 had been that the German military was simply far superior to the French, and that its victory had been “little more than a matter of marching.”¹ Over time, scholars have revised this explanation to reflect a collapse more akin to a military, political, economic, and cultural self-implosion. One historical aspect of this defeat, however, has remained unchanged since 1940: the inferiority of the French Air Force, the *l'Armée de l'Air*.

Unlike historians, including Julian Jackson, who have shown that the French Army was *not* drastically inferior in 1940, none have challenged the dismal state of the air force.² In 1938, the Chief of the French Air Staff General Joseph Vuillemin declared that if war with Germany had been imminent, his service would have been destroyed within 15 days.³ On the eve of the German offensive in the west two years later, the units of the French Air Force were disorganized, with numerous obsolescent aircraft, and were in no condition to contend with the well-coordinated German Luftwaffe. To discover why the air force was so unprepared, scholars have focused on interwar preparation and have favoured explanations of pre-war production, subjugation by the French Army, and a lack of clearly defined strategic doctrine for aerial warfare as key factors in the aerial debacle of 1940. However, the primary explanation which serves to link these important contributing factors is the fundamentally inhibiting position of the air force within the interwar French military and political hierarchy. This position denied the air force a voice both in its own rearmament, and also in its own tactical and strategic usage.



The French Air Force had emerged from the Great War with over 34,000 military aircraft and was considered Europe's aeronautical hegemon.⁴ The legend of France's *Chevalier de L'Air*, and the exploits of interwar French aeronautical pioneers such as Antoine de Saint Exupéry, helped establish an illusion during the interwar period that France possessed "one of the world's major air arms."⁵ The German Luftwaffe, by contrast, was dissolved with the Treaty of Versailles in 1919 and was institutionally reformed from scratch on 1 May 1933. Historian Edward L. Homze has called the Luftwaffe the Nazi regime's "favourite son," and notes that from its inception it enjoyed preferential treatment as a service.⁶ This was because its chief, Hermann Göring, as one of Hitler's chief lieutenants, was able to ensure that his pet service was financially and technologically well equipped.⁷ As a result, the new Luftwaffe received numerous highly trained and innovative officers from the Army and its general staff.⁸ In France, conversely, things were very different.

Despite its acclaimed public image, the French Air Force was also a young institution. It had only become its own distinct service a month before the Luftwaffe, in April of 1933. Unlike in Germany, French Army leaders jealously guarded their experienced staff officers, and so the air force began its institutional life with virtually no administrative capabilities or potential.⁹ Due to the venerated tradition of their former service, many of these transferred officers often possessed strongly divided loyalties, which resulted in an air force less committed to being autonomous or independent.¹⁰ Unlike Hermann Göring, French Air Ministers, most notably the influential Pierre Cot (1933–34; 1936–38), lacked the political position to influence French governmental leaders. Cot, whose passionate and ambitious advocacy for air force autonomy led to the establishment of France's first aerial warfare schools and institutions, was too radical for many French politicians, and his institutional reforms created hostility within the air force



Pierre Cot

as well.¹¹ Unlike its German counterpart, the French Air Force of the early 1930s found itself on a very short institutional leash and lacked the ability to both solidify itself institutionally within the French command structure, or to navigate and assert influence among the upper echelons of French government and politics.

The French Army and its leaders had gained great prestige from their victory in 1918. In the following decade the army would enjoy at its peak 64 per cent of the defence budget, while aviation was accorded only 13 per cent.¹² Army leaders came to dominate the upper circles of French interwar politics and military thinking; they were overrepresented in main military councils such as the *Section de la Défense nationale du Cabinet* and the *Commission du Conseil supérieur de la Guerre*.¹³ To these men, wars were decided on land, and therefore the air force was naturally a subordinate accessory whose importance was "apt to be exaggerated," as Chief of the General Staff Maurice Gamelin declared, and would be "confined to acting as an accessory to the army."¹⁴ Future Prime Minister Paul Reynaud, speaking to the French Parliament



PD Photo

Maurice Gamelin

in 1937, stated that “air power may wreak destruction, air power may reconnoitre; but air power does not conquer ground and cannot hold onto it.”¹⁵ As such, French policy reflected a desire to restrict the air force from contravening this ethos. The Air Minister, for example, could not alter or structure any air unit without the permission of the Minister of War.¹⁶ In Germany, by contrast, inter-service relations were more harmonious, and it was equally different in Great Britain, where in the words of British General Sir Hastings Ismay, “the Air Staff would prefer to have their forces under Beelzebub rather than anyone connected with the army.”¹⁷ In such an army-monopolized military, the efforts of air force chiefs and advocates were frustrated time and again in arguing for greater influence for their own service and autonomy in its own decision making. The epitome of this frustration can be seen in the 1936 debates concerning the creation of a commander-in-chief for combined French forces. Air force leaders, including Cot, fought desperately against the idea because of the air force’s inevitable subjugation by the inevitable army appointee.¹⁸ Gamelin told Cot in one meeting in June that he desired the air force to be under the “orders of

the commander-in-chief of the armies on the ground,” adding that he could not “conceive of the air force pursuing its own disconnected and independent action.”¹⁹ Cot’s arguments were in vain, and by 1938 it became policy for even theatre air force commanders to be under army control.²⁰

Army leaders were ill-equipped to judge air force matters during the 1930s because their views on air power were anachronistic to the contemporary military climate. Prevailing interwar aeronautical advances had emphasized the offensive capabilities of aircraft, and as such, many nations tailored their air forces towards offensive strategic goals.²¹ The interwar writings of H. G. Wells in *The Shape of Things to Come* (1933), and more importantly, of the Italian aviation strategist Giulio Douhet, in his work *Command of the Air* (1921), had a profound impact upon the role of the bomber, suggesting its use as a strategic and political weapon—a means of attacking a nation’s ability to make war.²² As in other nations, including Britain and Germany, Douhet’s concept of strategic bombing had early disciples in France, including Cot and General Paul Armengaud, who fought to focus early aerial production towards bomber primacy. “Plan 2” in 1936, for instance, aimed at producing 1,339 bombers to 756 fighters.²³ Author Pascal Vennesson has commented, however, that much of France’s military elite had been educated at the French War College during the 1920s, the *École de supérieure de guerre*, which had taught that aircraft served to extenuate traditional army functions, including reconnaissance and long-range artillery.²⁴ Consequently, recognition by army commanders about the necessity and value of innovation in air strategy was extremely slow, with air power often being ignored. Indeed, leading interwar innovator Charles de Gaulle largely neglected it in his influential work *Vers l’armée de métier* in 1934.²⁵ Such obtuseness would render air force strategists dumb to develop a comprehensive and modern aerial strategy.

Andrew Shennan once commented that the French were preparing for “an updated version of trench warfare” in the interwar period.²⁶ Indeed, the 1936 military publication *Instruction sur l'emploi tactique des grandes unités* held that the principles of warfare employed during the Great War were still valid, ignoring the implications of subsequent technological changes to warfare.²⁷ While historians such as Julian Jackson have argued and provided evidence to the contrary regarding army preparedness, such traditionalism was undeniably present in elite French military circles regarding air power. French interwar thinking was reactionary in its dependence upon fortification and mobile defence, and though French leaders did recognize that new forms of air power were being developed around them, they prevented air force doctrine from evolving past the point where it would contravene traditional French perceptions of aircraft usage, in particular regarding the idea of strategic bombing.²⁸ General Maxime Weygand expressed his feelings toward the concept in these terms: “There is something in these bombardments of defenceless people behind the front that smacks of cowardice which is repugnant to the soldier.”²⁹ Because of army dominance in military thinking, the air force could not focus itself to create a comprehensive doctrine for aerial warfare and consequently tried to balance its desire for modern innovation with the restrictive reconnaissance and ground support roles inherited from the Great War.³⁰ By contrast, General Walther Wever had codified Luftwaffe doctrine in 1935 in his manual *Die Luftkriegführung*, and as a result the Luftwaffe, with government support, encouraged flexibility, allowing for commanders to adjust their tactics to suit current events. The result was an air force honed to maximum effectiveness as an offensive tactical weapon.³¹ This contrast between German singularity of vision, and the French Air Force that had been organized towards, as Vennesson characterized, “a general amalgam of every possible goal,”³² reveals the extreme disadvantage which faced the French Air Force in be-



Charles de Gaulle

ing relegated to army subservience during the 1930s.

This lack of vision had a direct impact upon French pre-war production, which was marked by two principal inhibitions, both of which can be traced to the air force's lack of institutional power and subordination to the army, and were summarized by one French aviator in 1940, who stated that his squadron was doomed because “there are too few of us and our machines are obsolete.”³³ The quantitative inadequacy of the air force was due to low levels of output by a disorganized industry, and the tardiness of aerial rearmament.³⁴ In 1933, the French aircraft industry was “barely above artisan levels,” with one metal-aircraft contract being given to a furniture making firm.³⁵ In 1934, French aviation production equipment was on average 13 years older than German equivalents.³⁶ Cot sought to reverse the backwardness of aircraft production in 1936 through nationalization, in which the state “had the right to buy or otherwise acquire all organizations involved in such work and all their designs and construction rights.”³⁷ All firms would be grouped into the *Société natio-*



Maxime Weygand

*nales de constructions aéronautiques.*³⁸ Despite this, it took warnings in 1937 from Cot, who pronounced that France “will end up having the weakest air force because we have spent so little.” Also, Prime Minister Neville Chamberlain declared: “You [France] have no modern planes and are not ready to produce any,” which he qualified as “a great danger to your country,” to spur military and political leaders into emphasizing aerial rearmament.³⁹ Even so, it was only after the Munich Conference of 1938 that aerial rearmament received significant attention, but by that time, a full 15 months after army rearmament, the aircraft industry was, despite noteworthy efforts, in no position to cope with the increased demand for aircraft due to, in part and ironically, Cot’s recent dismemberment of the industry.⁴⁰

Despite such shortcomings, numbers alone did not decide the French aerial fate in 1940; it was also a case of aircraft type, both in terms of quality and modernity.⁴¹ Aircraft selection and design are of supreme importance to any air force, and the Luftwaffe, whose doctrine and industry had been firmly established by 1939, had accordingly

produced large quantities of purpose-built offensive aircraft, principally the Bf-109 fighter, Junkers 87 Stuka dive-bomber, and the Heinkel He111 medium bomber.⁴² Prior to the nationalization of the French aviation industry, the power of manufacturers’ lobbyists in government circles had resulted in a plethora of aircraft prototypes, very few of which were ever mass produced.⁴³ After nationalization, amazingly, design and development were removed from air force control, resulting in the further inability to determine specific aircraft functions.⁴⁴ Inter-service rivalry resulted in some aircraft being modified, such as the Bruguet 691 bomber, over 100 times, and the creation of the infamous “battle, combat, reconnaissance” (BCR) aircraft type, which tried to fulfil three different combat roles. By the time modern aircraft types finally went into mass production, such as the Dewoitine 520, they were obsolete.⁴⁵ In realization of the dismal state of the air force in 1938, French representatives sought to attain aircraft from America, but because of inevitable indecision about which aircraft types to order, only 137 American-built planes were combat ready on 10 May 1940.⁴⁶ In sum, the inadequacies of French aviation production are perhaps the greatest evidence for the disastrous consequences of the air force’s subordinated position within the military and political establishment.

Despite its many shortcomings, the French Air Force acquitted itself honourably during the war until France succumbed in June of 1940. Ultimately, this famed force was crushed militarily under the weight of its own obsolescence, inferior numbers, and strategic indecisiveness. This work has shown that although a lack of defined strategy and doctrine, subservience to an ignorant and arrogant sister service, and a disorganized and infeasible production industry were all decisive in making the French Air Force so ill-prepared for war, it was the lack of institutional influence or authority which predisposed and chained it to these problems. Thus, it is the restrictive and

administratively obtrusive interwar French military and government that are the primary reasons for the collapse of the French Air Force. Considering such hurdles, it is remarkable that such an underequipped, untried, and obsolescent force should have been accorded even a footnote in the war against a plentiful, confident, and well-coordinated Luftwaffe, which, as shown, had held a clear advantage since 1933, and which in 1940 was at the summit of its effectiveness and dominance. 🇫🇷

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The art of war owns certain elements and fixed principles. We must acquire that theory, and lodge it in our heads—otherwise; we will never get very far.

Frederick the Great



Understanding the Combined Air Operations Centre

CAOCC

By Major Ken Craig, CD

One of the inescapable truths regarding the conduct of any successful air campaign is the requirement to establish a command and control (C2) system that can effectively translate operational-level guidance from the air component commander (ACC) to the tactical-level pilot and crews conducting the flight missions. Without such a system an air campaign runs the risk of mis-employing limited resources, possibly resulting in unnecessary loss of life and prolonging military operations. An air force traditionally uses an air operations centre (AOC) as the means to execute C2 during national and multinational air campaigns. An AOC staffed with properly trained, qualified, and experienced personnel, equipped with interoperable information technology architecture, and empowered by a functional planning process, is essential for the C2 of air operations.¹ These truisms were recently on display at the combined air operations centre (CAOC) supporting Operation (Op) UNIFIED PROTECTOR, the North Atlantic Treaty Organization (NATO)-led imposition of an arms embargo, enforcement of a no-fly zone, and protection of civilians from attack or threat of attack in Libya. Given that future Canadian Forces (CF) operations will most likely be conducted in a coalition environment, an understanding of how the Op UNIFIED PROTECTOR CAOC was configured for success with trained personnel, robust infrastructure, and a deliberate planning process, may offer important insight for Royal Canadian Air Force (RCAF) personnel assigned to support coalition air campaigns.

Following a popular uprising against the Gadhafi regime in Libya, the United Nations (UN) passed Resolution 1970 imposing an arms embargo, and Resolution 1973 authorizing a no-fly zone over Libya. In early March 2011, NATO deployed airborne warning and control system (AWACS) aircraft and alliance ships to the central Mediterranean. Allied aircraft began enforcing the no-fly zone on 19 March 2011, as part of a coalition task force

led by the United States Africa Command (AFRICOM) under Op ODYSSEY DAWN. On 25 March 2011, NATO assumed command from AFRICOM, enforcing the no-fly zone and arms embargo under the auspices of Op UNIFIED PROTECTOR. At its peak, Op UNIFIED PROTECTOR employed approximately 8,000 military personnel, 260 aircraft, and 21 naval assets. During the seven-month air campaign, NATO forces and partner nations flew over 26,500 sorties, including over 9,700 strike sorties. These sorties destroyed more than 5,900 military targets, including over 400 artillery or rocket launchers and over 600 tanks or armoured vehicles.² Op UNIFIED PROTECTOR was terminated on 31 October 2011, shortly after the Libyan National Transitional Council announced that Libya had been fully liberated.

The RCAF contribution to Op UNIFIED PROTECTOR is well documented, consisting of approximately 400 personnel



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supporting CF188 Hornet fighters, CC150 Polaris tankers, CC130J tankers, CP140 Aurora maritime patrol aircraft, and CH124 Sea King maritime helicopters. The RCAF footprint in Italy was comprised of Task Force Libeccio Headquarters in Naples, an air coordination element in Poggio Renatico, Italy, the Sicily Air Wing operating from Trapani Air Base and Naval Air Station Sigonella, and maritime helicopter detachments operating from Task Force CHARLOTTETOWN and then Task Force VANCOUVER.³ Less well known is the RCAF contribution to the Op UNIFIED PROTECTOR CAOC located at Poggio Renatico, where a small cadre of Canadian personnel were assigned to NATO crisis establishment positions. Most RCAF personnel were sourced from units across Canada, although a few were assigned from their peacetime establishment positions while on overseas postings with NATO entities in Europe. Experience levels varied greatly, from those with familiarity in prior NATO-led air campaigns, to those only months removed from wings training.

To facilitate effective C2 during an air campaign, a functioning AOC must consist of three fundamental elements: personnel, infrastructure, and processes. Each element can be tailored to suit the particular operating environment (political, environmental, and national), but they must work in harmony with one another for the AOC to be successful. In this regard, the Op UNIFIED PROTECTOR CAOC was no different.

THE PERSONNEL

The Op UNIFIED PROTECTOR air campaign was led by the combined forces air component commander (CFACC), Lieutenant General (Lt Gen) Ralph J. Jodice, a United States Air Force (USAF) officer who at the outset of operations was serving as NATO's commander, Allied Air Component Command Headquarters Izmir, Turkey. As CFACC, he set the tone for the CAOC, focusing efforts on a daily basis to achieve campaign objectives that were captured

in operational-level guidance. Lieutenant General Jodice understood clearly that each nation's contributions were important to the success of the CAOC, no matter how minor. Although only eight nations conducted the majority of the strike missions, all NATO nations and coalition partners were represented in the CAOC.⁴ The CFACC regularly acknowledged the contributions of all personnel, no matter their rank or what national flag they represented. Lieutenant-General Jodice continually communicated direction to the staff during the many opportunities that presented themselves through the course of the daily battle rhythm, such as the commander's update briefing, the joint targeting working group, the air tasking order (ATO) release brief, and the twice daily shift-over briefs. These were important opportunities for the staff to understand and appreciate operational-level concerns that were having a direct impact on tactical-level flight operations. Of interest, there was discussion at the outset of Op UNIFIED PROTECTOR that perhaps the CFACC need not be co-located with the CAOC. However, Op UNIFIED PROTECTOR showed the importance of placing the CFACC in close proximity to the CAOC, whereby he could best influence planning activities in a timely manner and obtain



LT GEN R. J. JODICE



an unfiltered sense of the varied national liaison element concerns. The CFACC's ability to engage in open and transparent dialogue with his senior staff permeated all levels of the CAOC, resulting in a highly motivated and focused staff.

Two examples of the CFACC's ability to effectively guide CAOC efforts were seen in the later stages of the air campaign, one related to CAOC staff attitude, and the second to how operational-level guidance positively affected the outcome of strike operations. First, shortly after Tripoli fell to the rebels in late August 2011, there might have been a tendency for CAOC personnel to relax, as there was an expectation that the air campaign would soon end. The CFACC anticipated this potential change in attitude and kept staff focused on the mission of protecting civilians as he reiterated that the mission only ended when the North Atlantic Council (NAC) deemed it complete. Second, compared to other coalition air campaigns, there were few reported cases of civilian casualties and civil infrastructure damage resulting from Op UNIFIED PROTECTOR actions. Although this facet of the campaign design was motivated by both political and military concerns, much of the credit for the deliberate targeting plan can be attributed to the manner in which Lt Gen Jodice managed strike activities. Throughout the campaign, he continued to reiterate three fundamental steps when conducting offensive operations: apply the rules of engagement (ROE), understand the collateral damage estimate process, and ensure positive identification before striking targets. Effective leadership always starts at the top—clear direction from the CFACC and senior staff guided all CAOC activities, resulting in a successful air campaign.

Properly trained and qualified personnel are an important element in the CAOC weapon system. Fundamental to this is an understanding of the six-step air tasking cycle that traditionally consists of strategy,

target development, master air operations plan, ATO production, combat operations, and post-mission assessment.⁵ This academic knowledge must be coupled with experience working in either exercise or operational CAOCs. The RCAF personnel assigned to the Op UNIFIED PROTECTOR CAOC fulfilled roles in strategy development, ATO coordination, special instructions (SPINS), joint personnel recovery, air-to-air refuelling (AAR), targeting, combat operations, and intelligence, surveillance and reconnaissance (ISR) management. As mentioned earlier, RCAF experience levels varied greatly, highlighting the need for continual attention to the development of staff officers with experience in joint and coalition AOC planning activities. Numerous training opportunities are available to develop expertise in CAOC operations, such as the USAF's Exercise BLUE FLAG, and the United States Navy's Rim-of-the Pacific (RIMPAC) exercise, both of which employ a fully stood-up CAOC. During Exercise RIMPAC 12 to be held this year, the RCAF will hold the CFACC position for the first time, a responsibility that includes staffing nearly 50 positions in the 300-strong CAOC. Operating from the USAF 613 AOC located at Hickam Air Force Base, Hawaii, Exercise RIMPAC 12 is an excellent opportunity to advance RCAF knowledge and expertise in AOC activities. Training and experience in AOC battle procedures should be considered an essential element in the professional development of RCAF aviators and can be likened to maintaining good flight skills. Development of these skills takes practice, both at an individual level by attendance on courses such as the ACC collective training seminars offered at the Canadian Forces Aerospace Warfare Centre (CFAWC), and collectively through command-post and live-fly exercises. The RCAF must continue to strive to build an experienced cadre of CAOC-trained personnel so that we are prepared to hold key CAOC leadership positions in future coalition air campaigns.

Another facet of the personnel element that is commonly overlooked is the role of the national and component command liaison teams assigned to the CAOC. During Op UNIFIED PROTECTOR, the numerous liaison representatives (including their support elements) together were almost as large as the 300-person CAOC. For the RCAF, the Air coordination element at Poggio Renatico served as the functioning liaison between the CFACC, Task Force Libeccio Headquarters in Naples, and the deployed RCAF flying units. To be truly effective the liaison elements must be involved in all facets of the CAOC planning cycle, and they need to communicate regularly with both the CAOC staff and their nationally assigned flying units. This was certainly the case during Op UNIFIED PROTECTOR, when liaison elements, including the combined force maritime component commander (CFMCC) representatives, were encouraged to attend all CAOC briefings and actively engage staff throughout the planning cycle, commencing at strategy and concluding with mission assessment. These liaison elements possessed the authority to represent their respective nations on critical issues, and they had the responsibility of presenting national perspectives and considerations affecting combined air operations planning and execution. The ability of the CAOC and the national elements to function in a synergistic fashion became readily apparent in the later stages of the Libyan air campaign when deliberate targeting became difficult due to the ever changing situation on the ground. To address this issue, the CFACC initiated a dynamic deliberate targeting meeting at 1900 local time each day that involved combat operations, combat plans, and the national liaison elements. The purpose of the meeting was to discuss and assign target lists that had the potential to be struck within the next 12 hours. The capacity to coordinate complex strike issues within these shortened planning times was only possible due to the cooperative relationship that had developed between the CAOC, the national liaison teams, and the

tactical flying units. One key to the success of Op UNIFIED PROTECTOR was the ability to integrate the numerous national air force contributions into a cohesive force, an achievement only possible by establishing a CAOC that worked effectively with actively engaged and fully empowered national liaison elements.

THE INFRASTRUCTURE

The second fundamental element of a successful CAOC weapon system is the need for adequate infrastructure to support air operations planning activities. From outward appearances, the Op UNIFIED PROTECTOR CAOC was less than impressive, consisting of temporary modular trailers, relocated from Vicenza, Italy, where they had previously been used to support NATO air operations in the Balkans, initially over Bosnia-Herzegovina and later Kosovo. Despite the temporary feel of prefabricated buildings, the CAOC was functional and comprised all necessary elements to plan, direct, and control air operations. Communication systems enabled chat, phone, two-way secure radio, internet websites, streaming video, email, and video-conferencing, all of which are necessary in modern AOCs. The system architecture was interoperable with NATO allies and partner nations, and just as importantly, the system proved robust and reliable over the course of many months operating around the clock. It must be stated that the Op UNIFIED PROTECTOR CAOC benefited from outstanding host nation support from the Italian Air Force. Situated adjacent to NATO's standing CAOC 5 at Poggio Renatico, the Op UNIFIED PROTECTOR CAOC was able to enjoy service support that might not otherwise have been available at an austere location.

To direct air operations, the Op UNIFIED PROTECTOR CAOC utilized NATO's integrated command and control (ICC) software to generate airspace control orders (ACOs), joint target nomination lists,



ATOs, air tasking messages (ATMs), and to display a common operating picture (COP). The advantage of ICC was its widespread use and acceptance in previous NATO operations, thus minimizing staff training requirements at the commencement of Op UNIFIED PROTECTOR. Nevertheless, not all CAOC staff reported for duty with working knowledge of ICC, necessitating on-the-job training and formal training sessions before personnel were employable. There are many similarities between ICC and the National Aerospace Planning Process Integration Capability (NAPPIC) and Theatre Battle Core Management System (TBMCS)—C2 systems familiar to RCAF personnel. As a result, RCAF personnel experienced in NAPPIC and TBMCS should be able to seamlessly transition to future NATO-led operations that employ ICC.

THE PROCESSES

Processes in the AOC sense are generally defined as the means by which guidance originating from the CFACC is disseminated to tactical flying units to support command-driven objectives. There are a number of different processes employed to develop operational guidance but they generally follow similar steps that involve decision statements, objectives, alternatives, comparisons, and decision analysis. The CF and NATO both use the operational planning process (OPP) consisting of initiation, orientation, course of action (COA) development, plan development, and plan review. The end result of this deliberate planning process is an approved air operation plan (OPLAN). The Op UNIFIED PROTECTOR air component OPLAN was a collaborative effort between the CFACC and the commander combined task force (CCTF) planning staffs. Although the development of the CFACC OPLAN was limited to senior CFACC staff, the OPLAN was an important reference document for all CAOC divisions as it accomplished the following objectives, described how combined air capabilities and forces were to be integrated, identified objectives and tasks (to include an indication of the air capabilities necessary to

achieve air objectives), identified measures of success, accounted for potential pro-Gadhafi courses of action, and ensured CFACC air operations supported the overarching CCTF plan. It is important to note that the Op UNIFIED PROTECTOR CFACC utilized a formal planning process to develop an OPLAN that subsequently guided all air activities.

Based on the CFACC OPLAN, the CAOC daily planning process was regimented and fully synchronized with CCTF planning activities to ensure that CFACC actions were maximized to achieve both political and military objectives. At the CAOC level, the OPP culminated in the release of the air operations directive (AOD). The AOD ensured that coalition air operations effectively supported CCTF objectives while retaining flexibility to adjust to the normal range of air operations by apportioning effort in response to the dynamic changes taking place on the ground in Libya, especially following the fall of Tripoli in late August 2011. Although the CAOC strategy division was the primary focus for operational planning activities, the entire CAOC staff was reminded of CFACC intent through the continual refinement and subsequent briefing of changes to the AOD. The CFACC raised awareness of the AOD by ensuring that amendments were briefed during ATO release briefs and the daily shift-over briefs. Consequently, planning staff referred to the AOD on a daily basis as they built the air battle plans to ensure that priority of effort matched CFACC intent. This became extremely important in the later stages of the air campaign after pro-Gadhafi forces retreated to the towns of Bani Walid, Sirte, and Sabha, and attempted to flee westward to neighbouring countries. A current and relevant AOD assisted planning staffs in apportioning and prioritizing limited unmanned aerial vehicles (UAV), AAR, and ISR resources to the various tasks and providing staff with an understanding of the level of risk the CFACC was willing to accept when placing these assets in Libyan airspace

during the later stages of the air campaign. The AOD enabled the CAOC to match action with intent, thus ensuring that the CFACC's objectives were continually being achieved.

CONCLUSION

The effectiveness of a coalition air campaign depends on adequate system interoperability, commonality of doctrine and concepts of operation, shared strategic objectives and long-term investment in joint training and exercises brought together by mutually respected professional mastery.⁶

The Op UNIFIED PROTECTOR CAOC based at Poggio Renatico, Italy, was simply one small element in an international effort that successfully enforced UN Security Council Resolutions against Libya. The lessons for future AOCs established to support a coalition air campaign are clear: an understanding and focus on the people, infrastructure, and processes that comprise an AOC can lay the groundwork for effective results that support political and military objectives. Leadership in the Op UNIFIED PROTECTOR CAOC started at the top with a CFACC who understood the challenges inherent in coalition warfare, taking steps to effectively shape and develop his staff to address the myriad of issues that manifest themselves during a complex multinational air campaign. Operation UNIFIED PROTECTOR also reflected the fact that the infrastructure supporting an AOC can be established on a temporary basis as long as the tools to control, coordinate, and execute air operations are in place. Air warfare will continue to require an effective array of C2 information technology means, including chat, radio, internet, streaming video, and a software system to plan and execute air missions such as ICC, TBMCS, and NAPPIC. Finally, an AOC must incorporate clearly established and well documented planning processes that staffs at all levels can understand and employ to guide their respective planning activities.

To do otherwise risks introducing the element of surprise when political and military guidance demands caution, resolve, and results.

There can be no doubt that the NATO-led Op UNIFIED PROTECTOR was an immense success. Together with our NATO alliance and coalition partners, the RCAF and allied air forces delivered impressive results in seven short months, affording the Libyan peoples the opportunity to decide their own future free from the repression of a tyrannical regime. The majority of this success should be directed to the flight crews who operated in the Libyan airspace, ably supported by their maintenance crews at forward deployed bases. In some small measure the CAOC and national liaison elements located at Poggio Renatico, can be justifiably proud of the manner in which they supported the CFACC. The RCAF must continue efforts to develop personnel at all rank levels experienced in AOC processes through formalized training and multinational live-play exercise opportunities. The RCAF personnel armed with knowledge and experience in AOC activities will be able to seamlessly integrate with our coalition partners and eventually assume greater leadership positions in future air campaigns. 🇨🇦

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ABBREVIATIONS

AAR	air-to-air refuelling
ACC	air component commander
AFRICOM	United States African Command
AOC	air operations centre
AOD	air operations directive
ATO	air tasking order
AWACS	airborne warning and control system
C2	command and control
CAOC	combined air operations centre
CCTF	commander combined task force
CF	Canadian Forces
CFACC	combined forces air component commander
ICC	integrated command and control
ISR	intelligence, surveillance and reconnaissance
Lt Gen	Lieutenant General (US)
NAPPIC	National Aerospace Planning Process Integration Capability
NATO	North Atlantic Treaty Organization
Op	operation
OPLAN	operation plan
OPP	operational planning process
RCAF	Royal Canadian Air Force
RIMPAC	Rim of the Pacific (Exercise)
TBMCS	Theatre Battle Core Management System
USAF	United States Air Force

NOTES

1. See B-GA-401-000/FP-001, *Canadian Forces Aerospace Command Doctrine* (Interim Version), 2011.

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AIR POWER'S CONTRIBUTION TO COERCION

By Lieutenant-Colonel Brian L. Murray, CD



CF Photo



One of the frequent debates regarding the use of air power revolves around whether it can decisively win wars by coercing adversaries to accede to a nation's or coalition's will. While many theories of air power employment insist that strategic attack, where the adversary's centres of gravity and will to fight are the main targets, is the best path to victory, other military theories espouse that only battle winning, and the seizing and holding of territory can achieve victory.

Ideally, Service preferences should not drive the "ways" of warfare. In a truly joint environment, the strategic objectives, the most effective ways to achieve those objectives in the given situation, and the available means to achieve them (involving all elements of both national and military power) should determine the most suitable strategy. Coercive

strategies, aimed at affecting both the adversary's will and capability, can be effective tools in the strategist's toolbox to contribute to the achievement of strategic objectives involving the prevention of war, and if necessary, the prosecution of war.

This paper aims to describe what coercion, coercive diplomacy, and coercive force are, the types of coercive strategies and their goals, and how air power contributes to the achievement of these goals. It will also describe counter-coercion, offer some lessons learned from the analysis of air operations that have successfully contributed to coercion of an adversary, and take a look at air operations in Libya as an example of air power's contribution to coercion.

Coercion, coercive diplomacy, and coercive force

The Macquarie Dictionary defines "coerce" as: "to restrain or constrain by force, law, or authority; force or compel, as to do something or to compel by forcible action: coerce obedience," and "coercion" as "the act or power of coercing; forcible constraint or government by force." So by definition, coercion implies the use of force to compel someone to do something. In the military context, it is sometimes defined as: "Coercion is the use of threatened force, including the limited use of actual force to back up the threat, to induce an adversary to behave differently than it otherwise would."¹ It is also defined as: "Coercion, in its broadest

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sense, is causing someone to choose one course of action over another by making the choice that the coercer prefers appear more attractive than the alternative. In the international arena, coercion is usually intended to change the behaviour of states....”² While the common thread in these definitions involves influencing an adversary’s behaviour, it is the threatened use of force or limited use of actual force that causes this influence.

Diplomacy is defined as “the art and practice of conducting negotiations between nations.” (Merriam-Webster Dictionary). Coercive diplomacy would therefore be the art and practice of conducting negotiations between nations using threatened or actual force. This force could be generated from any or all of the four elements of national power—diplomatic, informational, military, or economic. If this force is military force, then the term “gunboat diplomacy” is sometimes used. “Although the term ‘coercive diplomacy’ has come to be associated primarily with military force, coercive diplomacy best describes a nation’s coercive use of the four pillars of national power in the foreign relations arena.”³ While it is appreciated that all forms of national power can contribute to coercive diplomacy and influence the behaviour of an adversary state, this paper will focus on the coercive use of military force, and in particular, the air power element of military force.

Types and goals of coercion

Before looking at how air power can contribute to coercion, it is important to appreciate what types of coercive strategies exist, and what are the goals of each of these strategies. While diplomatic effort or military campaigns can and do employ multiple ways to achieve their defined ends, knowing what these ways are meant to achieve and selecting the most appropriate ones for the situation at hand are key to their successful employment.

The two major categories of coercive strategies are deterrence and “compellence.”⁴ While these two concepts are related, in general, deterrence aims to prevent an adversary from doing something he would otherwise do or want to do, while compellence aims to alter behaviour already commenced or force an adversary to do what the coercer wants him to do. It is recognised that a significant amount of academic debate surrounds the inclusion of deterrence as a form of coercion. While deterrence is often viewed as a passive act, relying on the adversary’s perceived belief or fear of destructive retaliation by the deterring force or nation, and coercive force or compellence is viewed as an active act that relies on the effectiveness of the coercer’s methods, this author believes that the goals of deterrence and compellence are the same: to affect the behaviour of the adversary, one through fear and one through threat or use of force.

Deterrence can truly be said to be “in the eye of the beholder” and it most often involves the threatened use of force (not the actual use of force). It is aimed at the adversary’s will to commence hostilities, not at his ability to fight. For a deterrent to be deemed effective, it must cause the adversary to decide to forego initiating a possible action. The adversary must believe that the deterring force is capable of inflicting an unacceptable level of destruction on the adversary’s military force or nation, and the deterring nation’s willingness to inflict such destruction. Interestingly, a deterrent based on a perceived (but not actual) threat can be completely effective, while an actual threat of which the adversary is unaware is of no deterrent value at all.

Peacekeeping forces, stabilisation forces, and carrier battle groups are examples of military missions or capabilities used for deterrence of potential aggression or compellence (coercive force) should hostilities break out. Sometimes referred to as representing a coercive military presence,⁵ these forces have the capability, mission, and defined methods



of escalating their response to aggression that includes the use of force. Even unarmed personnel and observation technologies that have the capacity to view and report adversary action may act as a deterrent if the information they report could be damaging to the adversary nation's reputation or efforts and incur negative political, diplomatic, or military reactions.

Compellence can involve the threatened or actual use of force, ranging in scale from mildly influencing the adversary's will to physically removing the adversary's means to accomplish his goals and to resist coercion through isolation, capture, and/or destruction of his forces. Seizing, holding, and controlling the adversary's nation are the ultimate ways of compelling an adversary to behave in a prescribed manner. The spectrum of compellence therefore ranges from strategies to affect the will of the adversary to strategies that aim to destroy the adversary's ability to accomplish his goals and resist the coercer's will.

The spectrum of compellence can be described (see Figure 1 below) using three strategies: punishment, denial, and destruction. Military campaigns can employ lines of operation that use more than one of these compellence ways, and most likely will employ elements of all three.

Punishment strategies are designed to target the adversary's will to continue to fight or to continue to behave in a certain way. They seek to increase the costs of resistance or non-compliance with the coercer's will, and can be

directed against anything the enemy values, including military forces, economic wealth, national infrastructure, or international influence. While early air power theorists like Douhet viewed adversary civilian populations as valid targets for aerial bombardment, history has not shown appreciable evidence that the bombing of civilians has significantly decreased an adversary nation's will to fight, nor is it considered a legally, ethically, or morally justified strategy in the post-Second World War (WWII) era. Punitive coercion is intended to invoke the fear of future pain in the adversary's key decision-making apparatus.

Denial strategies are aimed at affecting the adversary's desire and ability to achieve their objectives. The purpose of these strategies is to reduce the likelihood that the adversary's pursuit of their intended objectives and their resistance to the coercing force's efforts will be successful. If the adversary is primarily using its military forces to achieve its objectives, denial is most often achieved by attacking the adversary's military forces, the means to generate those forces, and other systems that move and sustain them.⁶ Denial strategies seek to affect the will of the adversary by invoking a feeling of hopelessness due to the physical removal or degradation of the key adversary means being used to pursue their goals.

Destruction strategies are simple in concept, but may be extremely costly to both adversary and coercer alike. They are aimed at eliminating the adversary's capabilities. While there are psychological effects associated with



Figure 1. Spectrum of compellence

the loss of capability through its destruction, the aim of destruction is to remove options, and to leave the adversary without the means to resist and with no choice but to comply.

The coercive use of air power

Air power is a form of military power ideally suited for coercion. Considering its flexibility and its potential for concurrent application on many different types of missions, air power can be employed in various ways, for a multitude of purposes, to simultaneously achieve many different and complementary effects. By taking the air campaign approach to joint air operations, air power can concurrently deter and compel adversaries, in a scalable, variable manner, with minimal footprint in a contested operating environment, with great effectiveness and survivability.

Air warfare theory has largely been focused on using air power to affect the will of the adversary. The original air power theorists were typically army officers who had converted to their respective air arms during the First World War (WWI). Shocked and appalled by the huge cost of human life in attritionist trench warfare during that conflict, their thoughts turned to alternative warfare strategies. Hence, early theorists like Douhet, Sherman, and Mitchell professed that the object of war was to destroy the enemy's will to fight by attacking their infrastructure and heartland, rather than their fielded forces.⁷ Later, Slessor took a more balanced view by realising that in addition to strategic bombing, interdiction of the adversary's battlefield supply system and supporting land forces were also important contributions air power could make to warfare. Slessor, a product of the fledgling Royal Air Force in WWI, was the first air power theorist to take a truly joint view of warfare.⁸ Colonel John Warden, one the most noteworthy air power theorists of the modern era, like the early theorists, was also a proponent of strategic attack. Warden's view differed slightly in that he saw the enemy as a five-ring system, where each

ring represented groups of thematically bound centres of gravity. At the bullseye of the rings was the enemy leadership, which represented the highest priority target for air power. The outermost and lowest priority ring was enemy fielded forces. Warden's ultimate goal was to force the enemy to comply with friendly objectives:⁹

At the strategic level, we attain our objectives by causing such changes to one or more parts of the enemy's physical system that the enemy decides to adopt our objectives, or we make it physically impossible for him to oppose us. The latter we call strategic paralysis.¹⁰

All this is to say that air power theory has been relatively consistent since the first theorists put pen to paper in the early 1920s. It has been very much focused on coercing the adversary's will to fight, rather than using its brute force purely for the destruction of his fielded military forces, although the methods used to coerce the adversary's will have varied with time and theorist. While some espouse that air power is best suited for one coercive strategy or another, it is the inherent versatility and flexibility of air power and its offensive nature that enable it to contribute effectively to most, if not all, strategies.

Recognising the differences between theory and practice is important. Air power has inherent characteristics and capabilities that when postured for use or when employed may create many effects, some intended and some not intended. For example, destruction can adversely affect the adversary's morale and will to fight, but excessive destruction can turn fear into resolve (increase determination to resist). The application of force will incur many effects simultaneously, and to say that you can employ a specific air power capability in the context of a specific coercive strategy and achieve a single desired effect is unrealistic. The situation in which the coercive force is applied, and the combination of many

positive and negative influences both internal and external to the adversary force, will ultimately determine the degree to which the adversary's will is affected. When assessing the effectiveness of air power or air power effects to coerce, it is more realistic to speak of expected or intended effects and contributions to coercion, as opposed to drawing absolute causal linkages between air action and changes to adversary behaviour.

Air power and deterrence

The characteristics of air power make it a particularly effective and economical deterrent force. Speed, reach (in some cases global reach), responsiveness, flexibility, and penetration enable a relatively small force, centrally located, to quickly forward deploy, posture to dissuade or counter aggression, or conduct destructive, retaliatory strikes if necessary. If the reach of this force is global, then the deterrent effect becomes location independent. If the air power force is sufficiently robust (reasonable size, containing world class capability), the deterrent effect becomes adversary independent. While most air forces do not possess true global reach and dominance in all air power capabilities, the deterrent effect of medium and small air forces will likely be regional in nature and dependent on both the adversary strength and the type of situation presented.

Air power and compellence

The missions that air power elements undertake can produce multiple effects at the tactical, operational, and strategic levels of war. While air power can conduct control of the air operations aimed at preventing adversary air power from influencing friendly force operations, it achieves this objective by concurrently conducting offensive missions (offensive counter air) to destroy adversary air power capability either in the air or on the ground and defensive missions (defensive counter air) to deny the adversary's ability to achieve its air objectives in friendly airspace. Strike missions like air interdiction (AI) are generally employed to destroy targets on the

ground, but these strikes can be tailored to maximise demoralisation (will to fight) effects as well. The following paragraphs illustrate how air power can be or has been employed to achieve coercive effects.

Air power and punishment strategies

The characteristics of air power and the experience of air warfare have led many theorists to conclude that air power is fundamentally a strategic force with the inherent ability to strike targets of high strategic value. However, in the history of warfare to date, there is not a large body of evidence that says that strategic air attacks, by themselves, have directly coerced a regime to capitulate or appreciably accede to the coercer's demands. What can be stated is that there are examples of where air power has contributed significantly to a coercive diplomacy or a coercive force strategy.

As previously stated, the goal of a punishment strategy is to use the fear of future pain as the motivator for a change in behaviour. Perhaps the best example of this was the use of atomic bombs against Japan in August 1945. While the real and growing threat of invasion was also, undeniably, a coercive factor in influencing the behaviour of the Japanese leadership to change from resistance to compliance, the use of atomic bombs, and more importantly their continued potential use, was the tipping point:

The continuing [United States] US strategic bombing campaign, culminating in the atomic strikes against Hiroshima and Nagasaki, brought about Japanese surrender prior to an invasion. During his radio address to the Japanese people on Aug. 14, 1945, Emperor Hirohito was clear in recognizing the



PD Photo: Hiroshima

role of the atomic bombs in his decision to surrender. Although casualty projections for the scheduled land invasions are debatable, the atomic strikes undoubtedly saved hundreds of thousands of Allied lives, as well as millions of Japanese lives, both military and civilian.¹¹

A more recent example of air power's contribution to a coercive diplomacy strategy using punishment methods is Operation ALLIED FORCE and its air campaign over Serbia and Kosovo in 1999. While this campaign also employed significant elements of denial and destruction strategies, ultimately, the gradual increase in air attacks on targets in Serbia increased the pressure on Serbian leadership. When this coercive force was considered alongside the coercive presence of regionally deployed ground troops, and coercive diplomacy isolating Serbia from its presumed allies, it was enough to cause the Serbian leader, Slobodan Milosevic, to accede to the North Atlantic Treaty Organisation's (NATO's) demands:

[A]ir power might best be thought of as the force driving Milosevic into a deadend [sic] corner and threatening to crush him against the far wall. But had NATO not remained unified, Russia not joined hands with NATO in the diplomatic endgame, and the alliance not begun to develop a credible threat of a ground invasion, Milosevic might have found doors through which to escape from the corridor despite the aerial punishment.¹²

It should be noted that, although air warfare theory sometimes states that punishment strategies or targeting adversary

leadership (decapitation) can lead to a severe loss of morale, regime change, or capitulation, some prominent theorists argue against this idea. While Warden's five-ring theory places leadership at the centre of the enemy system and represents the highest priority target, Robert Pape states:

Decapitation, like punishment, is not likely to topple governments, by fomenting either popular rebellion or a coup. Air attack is a weak instrument for producing popular rebellions, mainly because conflict with a foreign power typically unleashes political forces (such as nationalism and fear of treasonous behaviour) which make collective action against even unpopular regimes unlikely until the opportunity for military victory has been lost.¹³

Air power and denial strategies

While coercive strategies based on denying the adversary's achievement of their goals seem like a compromise between punishment and destruction, they arguably represent the most complementary blend of desirable characteristics of each. Denial strategies recognise the interconnection between destruction and the will to fight. Air power, using its ability to range throughout the battlefield and deliver large-yield weapons with a high degree of accuracy, day and night, has proven to be a very effective weapon in using destruction to change the will of an adversary. Denial strategies are aimed at inducing a feeling of futility or hopelessness in the adversary. While punishment strategies aim to target any centre of gravity the adversary values, in denial strategies, coercive force is normally applied to the primary mechanisms used by the adversary to achieve their objectives. For adversary military operations, this mechanism is most often the adversary's fielded military force, including their supplies, lines of communication, and command and control (C2) centres.



The most striking example of the effect of air power on fielded military forces was the Gulf War in 1991. Of the estimated 400,000 Iraqi troops deployed to the Kuwait theatre of operations, more than 160,000 deserted before the commencement of the ground offensive, while over 80,000 more surrendered during the 100-hour ground campaign.¹⁴ While it is acknowledged that more than just air power was a factor in this, it was a significant one.

Strikes on enemy ground units were the air campaign's most significant contribution to the war. This use of air power—which did not rely on the spectacular new “smart weapons” but on traditional “dumb” iron bombs employed in mass—reduced the Iraqi army in Kuwait to a frightened and ineffectual fighting force. The result was light opposition, non-engagement, or surrender by Iraqi units and low casualties on both sides during the ground war. Air power had demonstrated most convincingly that—skillfully employed under the right conditions—it can neutralise, if not completely destroy, a modern army in the field.¹⁵



PD Photo: Iraq

The ability to coercively affect fielded military forces from the air is dependent on the situation. Large forces in prepared, static defensive positions like those used by Iraqi forces in Kuwait were susceptible to air strikes. Dispersed Viet Cong forces in Vietnam were much less susceptible. What can be gleaned from examination of the use

of air power to inhibit the adversary's achievement of their objectives through the use of coercive denial is that the psychological effect of attacking fielded forces can at times be the dominant effect and it is often the most underappreciated:

An Iraqi officer told his interrogator that he had surrendered because of B-52 strikes. “But your position was never attacked by B-52s,” his interrogator exclaimed. “That is true,” the Iraqi officer replied, “but I saw one that had been attacked.”¹⁶

Air power and destruction strategies

Air power has the ability to effectively destroy adversary targets wherever they can be detected. What makes air power well suited to eliminating the adversary's means of conducting warfare is its inherent ability to seek out and locate targets, and then rapidly send attacking forces to where the targets are. In addition to holding expertise in conducting devastating campaigns against a broad range of deliberate targets, air power has also developed the ability to bring aerial fires onto emerging, dynamic, or mobile targets equally effectively. While air power planners and strategists acknowledge that certain conditions are more conducive to air attack than others, and that air power is not the sole means of delivering destructive power to the battlefield, the sensors, intelligence resources, situational awareness, and C2 systems, and precision air weapon systems now being employed enable unprecedented levels of responsiveness and destructive capability on the modern battlefield. The battle of Khafji, the only post-invasion offensive operation conducted by the Iraqi forces during the 1991 Gulf War, showed how air power could detect, attack, and destroy emerging adversary ground forces with devastating effect:

On Jan. 29, 1991, Iraq launched its only offensive of the Gulf

War—and was promptly clobbered by airpower... Khafji demonstrated to all but the most ingrained sceptic the ability of deep air attacks to shape and control the battle and yield advantages for engaged ground forces. In 1991, airpower identified, attacked, and halted division-sized mechanized forces without the need for a synchronized, ground counterattack.¹⁷

Air power has also demonstrated the ability to destroy much of a nation's war-making capacity through strategic attacks. The US Strategic Bombing Survey conducted during the latter stages of WWII by a group largely composed of impartial civilian businessmen, lawyers, and bankers¹⁸ compiled 212 volumes of information and analysis regarding the actual effectiveness of strategic air power in both the European and Pacific theatres. This survey argued that, particularly in the last year of the war, "strategic bombing had a catastrophic effect on the German economy and transportation system, and this in turn had a fatal impact on German armed forces."¹⁹ Albert Speer, the German Minister for Armaments and War Production, later stated that May 1944, when the strategic bombing campaign was ramping up to full force, was the beginning of the end, and: "The war was over in the area of heavy industry and armaments."²⁰

Coercion and counter-coercion

Diplomacy, conflict, and coercion are not one-sided affairs. Both sides influence the outcome of any interaction. This concept certainly applies to coercive diplomacy and coercive force. As one side tries to coerce their adversary, the adversary will normally try to recognise and affect the vulnerable aspects of the coercer.

As an example, to avoid nuclear war, the deterrent strategy based on mutually assured destruction or MAD quickly developed. This strategy aimed to discourage any nuclear nation from threatening the use of its nuclear

weapons to achieve its aims by countering with the threat of full nuclear retaliation.

Mutual Assured Destruction, or mutually assured destruction (MAD), is a doctrine of military strategy and national security policy in which a full-scale use of high-yield weapons of mass destruction by two opposing sides would effectively result in the complete, utter and irrevocable annihilation of both the attacker and the defender, becoming thus a war that has no victory nor any armistice but only effective reciprocal destruction. It is based on the theory of deterrence according to which the deployment, and implicit menace of use, of strong weapons is essential to threaten the enemy in order to prevent the use by said-enemy of the same weapons against oneself.²¹

A coercer or dominant coercing force will also have centres of gravity that it must protect, as the adversary will most certainly try to apply coercive force against them. As an example, one of the common, critical vulnerabilities or own-force centres of gravity that are exposed to adversary coercion in almost every form of conflict is public support. As this is a "will to fight" vulnerability, the adversary will probably attempt to employ a coercive punishment strategy and escalate the cost of the conflict. The nature of these costs could be political (support for leadership), financial (sustainment costs for large military deployments or the costs of expensive equipment required for the operation), human

Photo: Patrick Finnigan





(casualties), or moral (excessive collateral damage and civilian casualties).

Air power can effectively negate coercive adversary attacks by demonstrating how the above costs can be minimised. In particular, air power can minimise human and moral costs by continuing to employ methods that minimise risk to non-combatants, demonstrate accuracy and proportionality in their offensive action, and maintain high levels of survivability for friendly combatants.

Key lessons learned from the application of coercive air power

Examination of the ability of air power to apply coercive force has revealed some key lessons for political leaders contemplating the use of deterrence or coercive force, and for military commanders, planners, and strategists charged with devising plans to apply coercive force.

1. Air power is most coercive when it is used in conjunction with other coercive elements. Coercive diplomacy, other military elements that form a coercive presence, parallel psychological operations and forces that can immediately exploit changes in adversary behaviour all enhance the coercive effect of air power.
2. Enemy demoralisation (the degrading of the will to fight) should be an air campaign objective.²²
3. Coercive strategies, including those employing air power as a coercive means, are often dependent on successfully exploiting one or more of the following three factors:²³
 - a. escalation dominance – turning the heat on the enemy up or down at will;
 - b. denial – defeating the adversary's military strategy; and
 - c. magnifying third party threats – reducing the ability of the adversary to defend against a third party. Air power was used successfully in this capacity at the start of Operation ENDURING FREEDOM (the Northern Alliance was the third party) and during Operation UNIFIED PROTECTOR in Libya (where the anti-government forces were the third party).
4. Coercion has a good chance of success if the coercer can bring about four related conditions:²⁴
 - a. adversary feels victory is impossible;
 - b. adversary feels resistance is futile (hopelessness);
 - c. surrender now is better than surrender later (the future will hold increased levels of pain); and
 - d. compliance brings some benefit.
5. Too much destruction, or destroying the wrong things (including non-combatants), can be detrimental to coercion and expose a coercing force to counter-coercion. Air power must be used proportionally and with discrimination—"For airpower to retain its credibility and hence its ability to coerce, it must be used with restraint."²⁵

Coercive force in Libya

Following the passage of UN Security Council Resolution 1973 on March 17, 2011, authorising "all necessary measures" to protect civilians, establish a no-fly zone, and enforce an arms embargo,²⁶ US and allied forces commenced military operations against Libya two days later. This action was called Operation ODYSSEY DAWN, and it was a US Africa Command-led combined operation



initially involving control of the air and strike missions. Offensive missions commenced with strikes by the United States Air Force (USAF) and the United States Navy (USN), French and British aircraft, and cruise missiles from American and British naval vessels.²⁷ On March 24, the US handed over control of the operation to NATO, and it became known as Operation UNIFIED PROTECTOR.

NATO and Libya – Operation UNIFIED PROTECTOR

Since March 24, an unprecedented coalition of NATO Allies and non-NATO contributors have been protecting civilians under threat of attack in Libya, enforcing an arms embargo and maintaining a no-fly zone. As NATO Secretary General Rasmussen explained, under Operation Unified Protector, NATO is doing “nothing more, nothing less” than meeting its mandates under United Nations Security Council resolutions. No NATO ground troops have participated in the operation—NATO’s success to date has been achieved solely with air and sea assets.²⁸

At the conclusion of Operation UNIFIED PROTECTOR, NATO and coalition aircraft had flown over 26,500 sorties, including 9,700 strike sorties, and had destroyed over 5,900 military targets.²⁹ No doubt, much analysis of the effects of this operation will now take place. This analysis will most certainly include coercive effects and the role air power played in achieving them. It may be valuable to take a cursory look at the way air power was employed in this operation to see if it fits into one or more of the coercive strategies identified in this paper, and if it appreciated the above lessons learned.

In essence, this operation employed what can be viewed as a coercive denial strategy to prevent the then Libyan government from achieving its objective of quelling the rebellion of a large portion of its civilian population by using force. Air power was used to target the Libyan means being used to attack rebel forces and subdue civilian unrest, and in particular the military aircraft and heavy weapons being employed. Whether air power

actually achieved denial effects, including the changing of Gaddafi's or his force's behavior or will to fight, requires more analysis. If it did persuade Gaddafi forces, and if air power only had tactical, destructive effects, it can still be viewed as being destructively coercive, if the elimination of Gaddafi's heavy weaponry, including much of his armor and artillery, rendered his forces incapable of defeating the rebel forces.



Interestingly, during the middle portion of this operation, when there seemed to be little progress in the civil war either way, doubts about air power's ability to significantly influence the outcome began to surface:

We have reached the stalemate that we always seem to reach when there is a great reliance on Western airpower supporting local forces. We saw it quite often in the Balkans and other places. There's a limit to how much air strikes can do especially when the government or loyalist forces have most of the firepower on the ground. There's a situation with the geography and the military tactics being used by both sides. To break the stalemate you'd need to have some quite heavy conventional forces move into the country.³⁰

While the above comments were written in early August, by the end of that month rebel forces, backed up by air power, had captured the Libyan capital, and Gaddafi's days were numbered. By the 20th of October, Gaddafi was dead and the rebel victory was secured. While it is difficult to gauge how much air power contributed to this result and how coercive that power actually was, there is little doubt that it contributed to the demise of Gaddafi and his forces.

The lessons learned regarding the coercive use of air power that have been shown previously may be of use in interpreting how air power affected this civil war. Byman, Waxman and Larson's assertion that coercion could be deemed effective if it defeated the adversary's military strategy (denial) or magnified a third-party threat³¹ seems applicable in the Libyan case. With the denial aspect already discussed above, the levelling of the playing field air power offered by defeating Gaddafi's air force and heavy weapons may have made the rebel forces (the third party) a bigger threat to Gaddafi's forces than previously anticipated. Perhaps the indication that the air power-backed rebellion was now being viewed as a serious threat came on September 1st when the press reported that one of Gaddafi's sons attempted to negotiate with the rebel leadership:

Saadi Gaddafi said on al Arabiya television he had officially been given the power to negotiate with the forces fighting the former dictator for control of Libya. The news was interpreted as being an indication that the colonel may be willing to bring an end to his war with opposition fighters. However, another son, Saif al Islam, spoke on the al Orouba television station—broadcast from Syria—and vowed to continue the resistance. In a recorded message he said his father was 'fine,' and urged supporters to continue battling opposition fighters, who he described as 'rats.' War of words: mixed messages are coming from Saif and Saadi Gaddafi. *Sky News* foreign correspondent Lisa Holland said the comments of Saif—who, along with his father, is facing arrest on war crime charges by the International Criminal Court—sounded 'delusional.'³²

Interestingly, while Saadi seemed willing to negotiate, his brother Saif, who was under indictment by the International Criminal

Court (ICC), was not. This begs the question if the ICC's action helped or hindered a quick resolution of the conflict. While indictment by the ICC may have lent some legitimacy to the forces opposing Gaddafi and de-legitimised the Gaddafi regime, when viewed against Mueller's guidance³³ for conditions conducive to successful coercion, it may have hindered. Although, the first two conditions (the adversary feels victory is impossible and resistance is futile) had probably been met by early September, the humiliation of public trial at the hands of the ICC, for Muammar and Saif Gaddafi, may have negated any chance of achieving the last two conditions (surrender now is better than surrender later, and with compliance comes some benefit).

With regard to counter-coercion, it appears that NATO's employment of air power and their counter-coercion methods were successful. From the commencement of air strikes, media messages like "CF-18s abandon attack on Libyan airfield to avoid collateral damage"³⁴ were clearly proactive measures to ensure public support for the operation was retained. Additionally, as zero NATO personnel were killed in combat in Libya during the almost 10,000 strike sorties flown, the perceived human cost of this operation remained low and not susceptible to coercive pressure on public support.

Air power's contribution to coercion in Libya will be judged over time as more information becomes available. There is little doubt that air power had a significant effect on this civil war, and some of the air power effects were coercive.

'Whether one agrees with the intervention, one thing is clear, and no surprise to objective observers: modern airpower [sic] is the key force that is directly leading to the overthrow of the Gadhafi regime—just like it was the key force that led to the replacement of the Milosevic regime in 1999, and the Taliban regime in 2001,'

e-mails retired Air Force [Lieutenant General] Lt Gen David Deptula, who planned the air campaign during the 1991 Gulf War. 'Airpower eliminated the Libyan integrated air defense system, instilled a no-fly zone rendering Libyan air forces ineffective, and reduced the organized Libyan Army to dismounted infantry unable to mass to achieve sufficient effectiveness to survive.'³⁵




Royal Canadian Air Force (RCAF) air weapons systems technicians load a GBU-31 Joint Direct Attack Munitions bomb on a CF18 aircraft in Trapani, Italy on 10 October 2011.

Conclusion

Coercion is not a single or rigid strategy to be used in conflict. It is a tool that a nation or coalition of nations can use to help impose its will on an adversary nation or definable group. The spectrum of coercion contains coercive strategies that aim to achieve the goal of dominating an adversary, but in different ways, including deterrence, punishment, denial, and destruction. These ways can involve all the elements of national power in their application, but one of the key coercive elements is normally military force. Coercive force is rarely one-sided, and most adversaries are able to apply coercion to some of the critical vulnerabilities or centres of gravity, particularly those associated with the financial, human, and moral costs of conflict.



Air power, with its inherent speed, reach, penetration, versatility, flexibility, and precision, is ideally suited for most coercive strategies. While in the past, air warfare theory sometimes exaggerated the likely coercive effects of air power, analysis of a century of air warfare experience has revealed that air power has been an extremely effective coercive force, although sometimes serendipitously so. The demonstrated capability of air power, most often acting in conjunction with other coercive elements, to force behavioural change on an adversary are now well documented. As General Omar Bradley put it: "Airpower has become predominant, both as a deterrent to war, and—in the eventuality of war—as the devastating force to destroy an enemy's potential and fatally undermine his will to wage war."³⁶ 

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

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Abbreviations

C2	command and control
ICC	International Criminal Court
NATO	North Atlantic Treaty Organisation
US	United States
WWI	First World War
WWII	Second World War

Notes

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3. Alan J. Stephenson, "Shades of Gray: Gradual Escalation and Coercive Diplomacy," Air War College, Air University, 4 April 2002, 3.

4. Mueller. Note: while Thomas Shelling, the noted author of *Arms and Influence*, also agrees with Mueller's assertion that deterrence and compellence are both elements of coercion, it is recognised that not all theorists share this view.

5. Stephenson, 9.

6. Mueller.

7. Raymond P. O'Mara, "Clearing the Air: Airpower Theory and Contemporary Airpower," *Air Force Journal of Logistics* XXXIV, nos. 1 and 2, annual edition, 52–59.

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Terminology Talk

{Article 4}

By Major James Bound, CD, BSc (Hons)

Integrated

Background

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

integrated, adj.

a. Combined into a whole; united; undivided. Also of a personality in which the component elements combine harmoniously.

Introduction

The term *integrated* is frequently used in modern parlance. It appears, however, that few federal government users of the term are aware of a specific context that appeared

a couple of years ago around the time that Operation (Op) HESTIA occurred. The “[Chief of Defence Staff] CDS Tasking Order for Canadian Forces (CF) Support to Haiti – Op HESTIA,” paragraph 3, stated in part, “The CF mission will be composed of a joint integrated force ... The CF commitment is part of a whole of government effort” The CF is quite proficient in joint and combined operations, but an *integrated operation* is a new twist. This article will attempt to bridge the gap between the whole-of-government context and the standard context which appears in the *Oxford English Dictionary* (OED). Is *integrated* the more practical way of saying *whole-of-government*? Let’s take a closer look.

Discussion

It is useful to situate *integrated* in the family of adjectives—including *joint* and *combined*—that relate to those military operations that go beyond being conducted by a single CF environment (i.e., Navy, Army, Air Force). The *Defence Terminology Bank* (DTB) contains the terms that define the three main types of operations by which military forces interact with other forces and/or organizations as follows:

Record 35248

joint

Said of activities, operations and organizations in which elements of at least two components participate. Note: The components are maritime, land, air and special operations. (Department of National Defence [DND]/CF, 2011)

Adjective used to describe activities, operations and organizations in which elements of at least two services participate. (North Atlantic Treaty Organization [NATO], 2009)

Record 18750

combined

Adjective used to describe activities, operations and organizations, in which elements of more than one nation participate. (NATO, 1999)

Record 41415

integrated

Said of activities, operations and organizations in which military and non-military elements combine to achieve a common goal through coordinated and complementary efforts. (DND/CF, 2011)

As a point of perspective, the United States Department of Defense (DOD) has a term which is essentially synonymous in concept to *integrated*, but tailored to the American lexicon:

interagency

Of or pertaining to United States Government agencies and departments, including the Department of Defense. (DOD, 2011)

Whether either *integrated* or *interagency* is used, the definition is sufficiently different from the *OED* definition to warrant special attention on the part of an author when the terms are being used in doctrine and other government publications. There is certainly nothing wrong with using the *OED* definition if that is the intended context, but in recent cases the proper usage of *integrated* across Government of Canada departments has led to some degree of confusion on the part of the reader (at least those who are familiar with the difference).

Why was *integrated* chosen as opposed to *whole-of-government*? A check of the DTB indicates that the definitions for *whole-of-government approach* and a related term, *comprehensive approach*, are as follows:

Record 35242

whole-of-government approach

An integrated approach to a situation that incorporates diplomatic, military, and economic instruments of national power as required. (DND/CF, 2009)

Record 34522

comprehensive approach

A philosophy according to which military and non-military actors collaborate to enhance the likelihood of favourable and enduring outcomes within a particular situation. Note: The actors may include joint or multinational military forces, Canadian government departments and agencies (whole of government), other governments (foreign, provincial and municipal), international organizations (NATO, UN), non-governmental organizations (CARE, OXFAM), private sector entities or individuals. (DND/CF, 2011)




The emphasis in *whole-of-government approach* is clearly “national”; whereas, the emphasis in *comprehensive approach* is “multinational.” Furthermore, *comprehensive approach* goes a bit farther in scope because the “non-military actors” segment includes other levels of government, international organizations, non-governmental organizations, etc. Notwithstanding the differences in context, both are intended to reflect the same concept as *integrated*, and this is where usage of *whole-of-government approach* becomes problematic. With a number of terms being essentially synonymous in concept but slightly different in context, the value of tending towards simplicity becomes the overriding factor. An *integrated operation* is thus the “new kid on the block,” as “an operation involving the coordinated and complementary efforts of military and non-military organizations to achieve a common goal.” (DTB record 37297, DND/CF, 2010)

Summary

Using the *OED* as a reference, the term *integrated* is a common adjective that relates to combining elements into a unified whole. In the context in which military actors combine their efforts for a common objective with other non-military actors, either nationally or internationally, the *OED* definition does not go far enough. The term *integrated* has been chosen, and the definition broadened, to apply to “activities, operations and organizations in which military and non-military elements combine to achieve a common goal through coordinated

and complementary efforts.” As an adjective, *integrated* is now situated in a family of terms related to military operations that include the traditional ones of *joint* and *combined*.

The eighth Air Force Terminology Panel meeting took place in October 2011, with 59 terms eventually being approved for inclusion in the DTB. Note that a given term may have been subsequently modified at the Joint Terminology Panel or the Defence Terminology Standardization Board; therefore, always consult the latest version of a term by accessing it in the DTB. A table listing the approved terms follows.

Note: The reader is encouraged to check the CFAWC terminology management website at any time to review the status of candidate Air Force terms: http://trenton.mil.ca/lodger/CFAWC/Terminology_e.asp?Type=Brief&queryPanel=AFTP. 

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English Term	French Term
go/no-go list; go/no-go equipment requirements list	liste go no-go
HAVE QUICK	HAVE QUICK
threat environment	contexte de menace
criticality assessment	évaluation de la criticité
hazard	danger
risk assessment	évaluation du risque
risk management	gestion des risques

threat	menace
hazard level	niveau de danger
mission support (msn sp)	soutien de mission (sout msn)
threat level	niveau de menace
capability development	développement des capacités
capability gap	écart de capacité
commencement of operational service	début du service opérationnel
full-spectrum operations; three-block war (FSO)	opérations dans l'ensemble du spectre; guerre à trois volets (OES)
horizon	horizon
air power	puissance aérienne
conventional warfare	guerre conventionnelle; guerre classique
driver	moteur
non-state actor	acteur non étatique
projecting power	projection de la puissance
concept	concept
concept development (CD)	développement de concepts (DC)
duckbutt	duckbutt
air component coordination element (ACCE)	élément de coordination de composante aérienne (ECCA)
Canadian entitled person (CEP)	personne canadienne autorisée (PCA)
tactics, techniques and procedures; tactics, techniques and procedures document (TTP)	tactiques, techniques et procédures; document des tactiques, des techniques et des procédures (TTP)
standard-manoevre manual (SMM)	manuel de manoeuvres standard; manuel de manoeuvres normalisées (SMM)
Air Force Integrated Information and Learning Environment (AFIILE)	Environnement informationnel et d'apprentissage intégré de la Force aérienne (EIAIFA)
Synthetic Environment Coordination Office (SECO)	Bureau de coordination de l'environnement synthétique (BCES)
Air Force Experimentation Centre (AFEC)	Centre d'expérimentation de la Force aérienne (CEFA)
Air Force expeditionary capability (AFEC)	capacité expéditionnaire de la Force aérienne (CEFA)
distributed mission operations centre (DMOC)	Centre des opérations - missions réparties (COMR)



International Traffic in Arms Regulations (ITAR)	International Traffic in Arms Regulations (ITAR)
Director Air Force Training (Dir AF Trg)	Directeur - Instruction de la Force aérienne (Dir Instr FA)
community advisory group (CAG)	groupe consultatif de la communauté (GCC)
rim of the Pacific; Pacific Rim (RIMPAC)	côte du Pacifique; littoral du Pacifique (RIMPAC)
separate correspondence (SEPCOR)	correspondance séparée
future air navigation system (FANS)	futur système de navigation aérienne (FANS)
multirole tanker transport (MRTT)	avion de transport et de ravitaillement multirôle (MRTT)
Public Works and Government Services Canada (PWGSC)	Travaux publics et Services gouvernementaux Canada (TPSGC)
inertial reference system (IRS)	système inertielle de référence (IRS)
electronic flight instrument system (EFIS)	système d'instruments de vol électroniques (EFIS)
Director Aerospace Equipment Program Management (DAEPM)	Directeur - Gestion du programme d'équipement aérospatial (DPEAG)
Federal Air Regulations (FAR)	Federal Air Regulations (FAR)
inertial reference unit (IRU)	centrale inertielle de référence (IRU)
estimated life expectancy (ELE)	durée de vie prévue
cockpit display unit (CDU)	indicateur de poste de pilotage (IPP/CDU)
approved maintenance organization (AMO)	organisme de maintenance approuvé (OMA)
Transport Operational Test and Evaluation Flight (TOTEF)	Escadrille d'évaluation et d'essais opérationnels – Transport (Ele EEOT)
technical assistance visit (TAV)	visite d'aide technique (VAT)
operational standardization visit (OSV)	visite de normalisation opérationnelle (VNO)
tactical airlift unit (TAU)	unité de transport aérien tactique (UTAT)
Air Force Doctrine and Training (AFDT)	Doctrine et instruction de la Force aérienne (DIFA)
Air Standards, Training, Readiness and Automation (ASTRA)	Normes aériennes, instruction, disponibilité opérationnelle et automatisation (ASTRA)
training standardization visit (TSV)	visite de normalisation d'instruction (VNI)
flying training evaluation (FTE)	évaluation de l'instruction en vol (EIV)
readiness assistance visit (RAV)	visite d'aide - disponibilité opérationnelle (VADO)
operational evaluation (OPEVAL / op eval)	évaluation opérationnelle (OPEVAL / éval op)

POINTS OF
INTEREST

*APPLYING AEROSPACE POWER
AT THE OPERATIONAL LEVEL OF WAR:*
THE TIME-SPA



The B-GA-400-000/FP-000, *Canadian Forces Aerospace Doctrine* describes the nature of conflict, the nature of aerospace power, its characteristics, and tenets. An examination of key elements in the publication reveals a fundamental challenge to planning the employment, command, control, and coordination of aerospace forces: the time-space challenge. It is the time-space challenge that makes the ways and means of planning and executing aerospace operations unique within a joint force.

CE CHALLENGE

BY LIEUTENANT-COLONEL JOHN R. ANDERSON, CD



The nature of conflict is such that success is largely a matter of judgement, based on knowledge, under conditions of unpredictability, chaos, danger, exertion, uncertainty, fear, and chance.¹ “Aerospace power can be employed independently across the spectrum of conflict” and “projected globally, unimpeded by surface features.”² As well, “the inherent speed of aerospace vehicles provides a rapid response capability that can be projected over great distances.”³ On the tenets of aerospace power, it states: “Inherently flexible and uniquely versatile, aerospace resources can be quickly and decisively shifted from

one objective to another across a broad spectrum at the strategic, operational and tactical levels of conflict.” It further explains that “the coordinated employment of aerospace power with or in support of other forms of national power can produce synergistic effects that exceed the contributions of individual forces employed separately.”⁴ On the whole, these qualities of aerospace power provide tremendous advantages in the projection of military power. Aerospace power is, however, limited in two key areas: it is impermanent and therefore, dependent upon a support base of operations.⁵

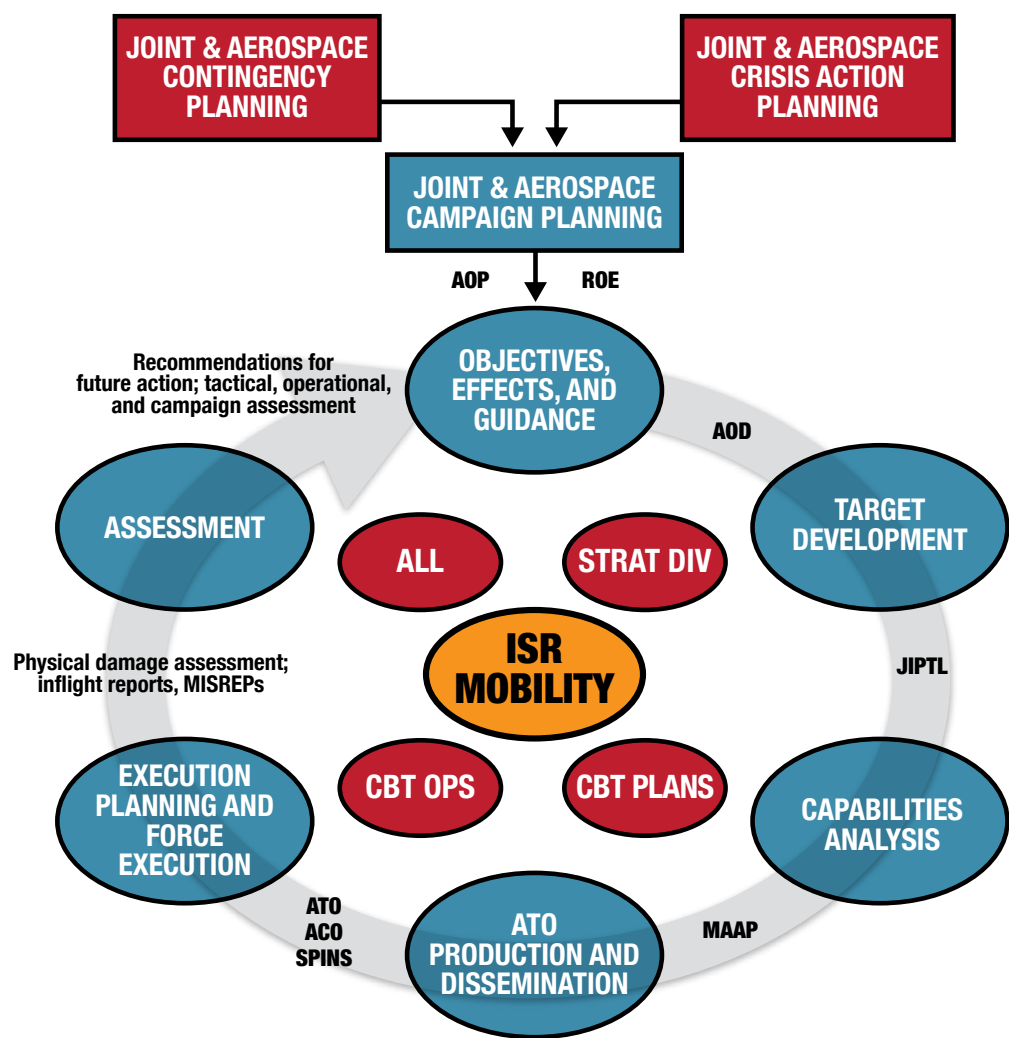


Figure 1. The air tasking cycle⁶

Viewed on the whole, what these statements indicate is that aerospace forces can take independent action at all three levels of war simultaneously, and the apportionment of forces at each level can be changed rapidly, thus giving the perception of ubiquity, or being able to act everywhere all the time. Effects are, however, more advantageous when aerospace power acts with other forms of national power. In other words, the speed with which aerospace forces can act is not necessarily directly proportional to the speed with which the most favourable effects are realized. In order to optimize the contribution

of aerospace actions, therefore, they must be harmonized with other actions of other elements of national power. As well, the need for support basing is critical to ensuring aerospace power can achieve persistence, including the continuous revisiting of targets.⁷

This versatility, flexibility, and speed naturally lead to planning and conducting aerospace operations using a time-based approach. In essence, this means apportioning aerospace forces across the three levels of conflict per unit of time to achieve desired effects. In order to do this effectively, the commander responsible

for recommending the apportionment (the Air Component Commander [ACC]) and the commander approving that apportionment (the Joint Force Commander [JFC]) must both understand and agree to the objectives being sought and to the desired effects. Therefore, the ACC's air campaign plan must support the JFC's joint campaign plan. Other component commanders' plans will be event based because surface and sub-surface forces cannot act at all levels of war simultaneously, in that it takes considerably longer for both land and maritime forces to deploy to areas of operations (AOs) and move within those areas. In contrast, the air component can deploy forces and act across the entire AO, if those aerospace forces have the requisite support basing in place to do so, at a much more rapid pace. In order to illustrate this, one can use an electrical circuit analogy: the joint campaign will be progressive and conducted in series, while the air campaign can be conducted in parallel. The challenge for the ACC, then, is understanding where and when to recommend apportionment of aerospace forces. Therefore, a sound understanding of campaign objectives and desired effects is the key. How do the ACC and the air component headquarters accomplish this?

Figure 1 depicts the air tasking cycle; the way in which aerospace operations are planned and conducted. This cycle connects overlapping—but discrete—activities and is supported by a targeting cycle, intelligence, surveillance, and reconnaissance (ISR),⁸ and air mobility. This flows logically from the basic requirement to understand what is happening in the environment, to control the environment, to apply effects when and where required/desired, and to manoeuvre personnel, equipment, and supplies when and where they are needed. Although specific aerospace roles and missions and their associated weapons systems or platforms can be further refined and defined, they essentially fall into four categories or types: situational awareness, control of the air, strike,⁹ and mobility.

The organizational construct that conducts the air tasking cycle is the aerospace operations centre (AOC). It is the means by which aerospace operations are planned and conducted. This basic construct can be qualified as follows: the AOC becomes a joint aerospace operations centre (JAOC) when aerospace forces from other services are coordinated and/or controlled through one process, and the AOC becomes a combined aerospace operations centre (CAOC) when aerospace forces from different nations are coordinated and/or controlled through one process. The Joint Force Air Component Commander (JFACC) or Combined Force Air Component Commander (CFACC) commands and/or controls assigned aerospace forces and coordinates those additional aerospace forces made available. Finally, when joint and combined aerospace forces are involved, the Combined JFACC (C/JFACC) uses a Combined JAOC to conduct the air tasking cycle. This is the essence of what centralized control means to aerospace forces at the operational level: one commander, one operations centre, and one set of products that permit the coordination of all aerospace forces across the battlespace. It follows then, that for aerospace forces, joint, combined, and even interagency mean that any given country's force package contribution will be applied across the entire battlespace by the C/JFACC and not strictly, or solely, in support of its own land, maritime, and SOF contributions. In the Canadian context, an air expeditionary wing could be co-located with a Canadian Army battle group and never be tasked to support each other exclusively. This presents a significant challenge to the concept of Canadian air-land integration at the operational level.

The primary mechanism of the command and control process is the air tasking cycle produced by the “engine” that is the AOC. The input that “gets the engine started” is the ACC's air campaign plan.¹⁰ The first and most important activity, then, is the determination of the objectives and the desired effects

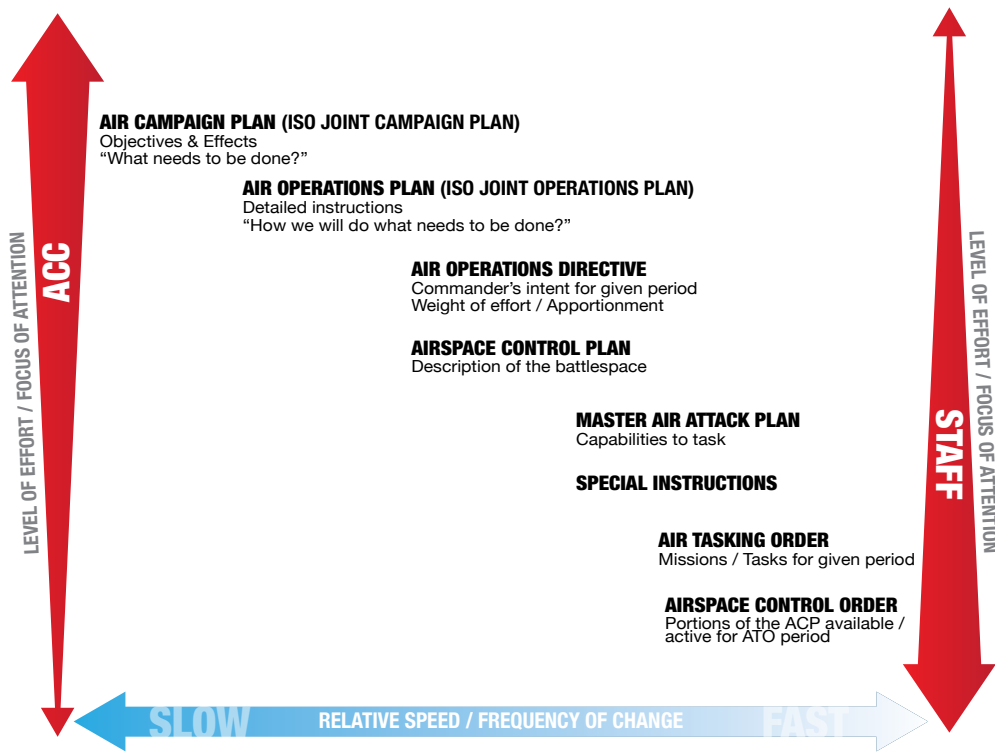


Figure 2. The air tasking cycle: an alternate perspective

and what support needs to be put in place to enable aerospace forces to act. From this it is possible for the ACC to articulate:

1. intent for a given period (the air operations directive [AOD]);
2. the prioritized list of targets to be prosecuted in a given time period (those targets—physical and psychological—on the joint integrated prioritized target list [JIPTL] that aerospace forces will focus on);
3. the resources or capabilities assigned to those priorities (the master air attack plan [MAAP]);
4. the formations, units, and sub-units that will be tasked to act (the air tasking order [ATO]);
5. the airspace construct within which all aerospace forces will operate (airspace

control plan [ACP] and airspace control order [ACO]); and,

6. any special instructions (SPINS).

All of these permit the decentralized execution of aerospace operations. The structure of the AOC, focus of the divisions therein, activity, and pace of product generation (from air campaign to ATO) permits the ACC to provide a coherent, coordinated, and rapid response to changing conditions in the battlespace as depicted in Figure 2, a time-based approach to aerospace operations.

The air tasking cycle is the optimal method that modern aerospace forces follow to plan, task, execute, and assess aerospace operations. The cycle operates at the pace required to meet the objectives set forth by the JFC. It is the means by which the ACC determines and assigns the appropriate missions and tasks that will achieve the JFC's objectives by generating the desired air effects. Understanding and

dealing with the time-space challenge—the advantage of aerospace forces being able to act across the spectrum of operations rapidly and simultaneously creates a disadvantage in terms of the time available to determine objectives and desired effects, and to position the requisite support before taking action—allows the ACC to employ aerospace power to best effect in the joint environment. ☉

Lieutenant-Colonel John Anderson is an air combat systems officer (ACSO) with two tours flying fighters and electronic warfare (EW) aircraft, and three tours flying tactical airlift on CC130s. He has experience as a project director for a variety of EW projects and was a member of the Directing Staff at the Canadian Forces College for four years. He is currently the Branch Head for Education and Specialty Training at the Canadian Forces Aerospace Warfare Centre (CFAWC).

ABBREVIATIONS

ACC	air component commander
ACO	airspace control order
ACP	airspace control plan
AO	area of operations
AOC	aerospace operations centre
AOD	air operations directive
AOP	air operations plan
ATO	air tasking order
CAOC	combined aerospace operations centre
CBT	combat
CFACC	combined force air component commander
C/JFACC	combined joint force air component commander
ISR	intelligence, surveillance and reconnaissance
JAOC	joint aerospace operations centre
JFACC	joint force air component commander
JFC	joint force commander

JIPTL	joint integrated prioritized target list
MAAP	master air attack plan
MISREP	mission report
ROE	rules of engagement
SPINS	special instructions
Strat Div	strategic division

NOTES

1. B-GA-400-000/FP-000, *Canadian Forces Aerospace Doctrine*, 2nd Edition, December 2010, 23.

2. Ibid., 18, 25.

3. Ibid., 26.

4. Ibid., 28.

5. Ibid., 25–26.

6. This diagram is based on Figure III-12, Joint Air Tasking Cycle, JP 3-30 “Command and Control for Joint Operations,” Joint Chiefs of Staff, 12 January 2010, III-22.

7. B-GA-400-000/FP-000, 28.

8. More accurately described as the intelligence enterprise cycle.

9. Where strike is understood to mean an application of energy, physical or psychological, lethal and non-lethal.

10. A campaign is a series of operations designed to achieve a common objective within a given time and space. An operation is a series of military actions or battles needed to gain the objectives of a campaign. A battle is a series of tactical engagements. Based on definitions found in the *Defence Terminology Bank*, <http://terminology.mil.ca/term-eng.asp> (accessed November 2011).

BOOK REVIEWS

HELLFIRE



By Ed Macy

London:

HarperPress, 2009

422 pages

ISBN 978-0-00-728820-5

Review by

Captain Scott Fuller (Retired), CD

The author of *Apache*, Ed Macy, picks up where that book left off with another chapter in his Apache flight time in Afghanistan. In this book, he takes the reader back in time as a corporal in a parachute regiment where his ambition to seek selection in the Special Air Service (SAS) was brought to an abrupt halt by a highway accident, leaving him in a reduced physical state and precluding him from taking or passing the gruelling physical and mental standards of the SAS.

He re-focuses his military career by aiming higher, so to speak, to become an Army Air Corps pilot, first by winning his wings and then by becoming a tactical helicopter pilot. The author describes his experiences in BATUS, the British Army Training Unit Suffield in Alberta, his flying training in the United Kingdom, and his ultimate selection and training on the Apache.

The book takes the reader into a wide range of Afghanistan air combat scenarios, including a number of ground support live-fire missions with a few of those on “bingo” gas, the author hoping and hopping back to base to refuel and rearm and return to “the gunfight.”

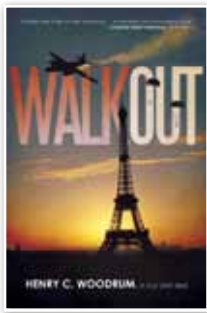
The author relates his experiences flying the Apache in an “in-your-face” manner, without pause for literary correctness, but in a frank and direct manner which the reader will no doubt find very interesting. The author not only proves his competence in command, but also the Apache’s competence in combat. Both the author and machine are well suited to each other.

This book is highly recommended to all tactical helicopter pilots and crews and to those involved with air force doctrine and training. 🇨🇦

The reviewer served 32 years in the Regular Force and eight years in the Primary Reserve before accepting a position with the public service and is currently the Senior Procurement

Officer at the Ottawa Detachment of the Canadian Forces Aerospace Warfare Centre. Scott Fuller is also a Director at Large for Policy Development for the North Atlantic Treaty Organization (NATO) Veterans Organization of Canada and a technical advisor to the Honours, Awards and Decorations Advisory Committee at Rideau Hall.

WALKOUT



By Henry C. Woodrum,
Lt. Col. USAF (Ret)

New York:
iUniverse, Inc, 2010
318 Pages
ISBN 978-1-4502-3990-5

Review by
Lisa Moulton

Talking with other evaders through the years has confirmed my feelings: without the help of the Underground, many more of us would be caught. Only with luck and the help of the French Resistance did I avoid capture on several occasions.¹

— Lt. Col. (Ret) Woodrum

Having attended a memorial service for the Escape Lines Memorial Society and read *A Quiet Woman's War*,² it is not surprising that *Walkout* caught my eye while browsing in Shakespeare and Company, an English-language book store in Paris. This war memoir is Lieutenant Colonel (United States Air Force, retired) Woodrum's recollection of his 35th mission: bailing out over Paris, subsequent evasion, and the support that he received from the underground.

On 28 May 1944 (10 days before the D-Day invasion), then Lieutenant Woodrum was flying Y-5-T, a Martin Marauder B-26

with the 495th Bombardment Squadron of the United States Ninth Air Force based at Stansted, England. Along with another crewmember, Woodrum had been scheduled to start three days of leave that day. However, as happens in many of these stories, Woodrum and his crew were replacing another crew, on this occasion because that pilot was sick. The mission that day was to bomb a bridge in Paris. The briefing finished with: "One more thing. Intelligence reports indicate that evasion from Paris would be nearly impossible now.... So, if you get in trouble, avoid Paris at all costs."³


During the run-in to the target, Woodrum's crew watched the flight leader's aircraft get hit and most of the crew bail out. Leading the remainder of the flight to the target, Woodrum's aircraft took a direct hit, resulting in a fire in #1 engine. While dealing successfully with the engine fire, the aircraft took another direct hit. The shell did not explode, but it tore a huge hole in the left wing. After the crew dropped their load on the bridge, the aircraft took another direct hit. By now, the "right engine was churning, the other was feathered and afire and [they] had another fire in the bomb bay. The hole in the left wing was still spewing fuel, and [his] controls were shot."⁴ The crew had to bail out. Woodrum would not know what happened to his crewmates until after the war. He landed on a tile roof about a mile north of the Eiffel Tower and the Arch of Triumph.

What follows is an account of the events of the next three months, including near brushes with German soldiers, assistance from

the underground, and his behind-the-lines perspective on the liberation of Paris in August 1944. Although written 30 years after the events occurred, Woodrum provides a detailed account of this three-month period. Early on, he shares his recollections of his escape and evasion training and provides examples of techniques that were successful. For instance, immediately after he landed, German soldiers scoured the neighbourhood looking for him. Spotting some labourers nearby, Woodrum picked up a paint can and walked down the street in sight of the German soldiers.

The book's one detraction is its title. I had expected to read the story of an individual, who after being shot down behind enemy lines, actually walked out of Europe. This was not the case for Woodrum. Without taking away from his achievements, he landed in Paris and spent the next three months in the local area. The book could be improved with the addition of one or more maps to assist the reader in understanding the locations that Woodrum takes pains to describe in great detail.

Woodrum wrote his memoir to ensure that the world would know about the activities pursued and the risks accepted by the members of the French underground. This

story is but a small part of the events of the Second World War, but it is one more piece of a story that must be remembered. 

Lisa Moulton graduated from the Royal Military College in 1985 with a Bachelor of Engineering and served as an Electrical and Mechanical Engineering officer in the Canadian Forces until 1994. More recently, she has worked as an editor, first in-house at the Canadian Forces Aerospace Warfare Centre, and currently freelance. She lives in the United Kingdom with her husband, the Canadian Air Force Liaison Officer to the United Kingdom Air Warfare Centre.

Notes

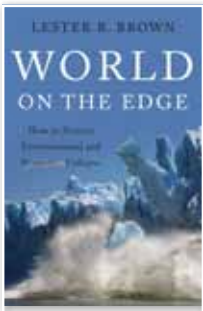
1. Henry C. Woodrum, *Walkout* (New York: iUniverse Inc., 2010), 2.

2. See Canadian Air Force Journal 4, no. 1 (Winter 2011) for the book review. It is also available at http://www.rcf-arc.forces.gc.ca/CFAWC/eLibrary/Journal/Vol4-2011/Iss1-Winter/AF_JOURNAL-Vol4-2011-Iss1-Winter_e.pdf#Page=53 (accessed September 29, 2011).

3. Woodrum, 6.

4. *Ibid.*, 18.

WORLD ON THE EDGE



By Lester R. Brown
(President of the Earth Policy Institute)

New York:
W. W. Norton & Company
Inc., 2011
327 pages
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(paperback)

Review by

Major François Dufault, CD

Lester R. Brown describes this book as an attempt to answer two fundamental questions: 1) If we continue with business as usual, how much time do we have left before our global civilization unravels? 2) How do we save civilization? The solution, from Brown and the Earth Policy Institute's perspective, is what they call Plan B, outlined in this book: *World on the Edge*.

By this point, you are probably asking yourself: why is such a book pertinent to a military journal? Well, according to Brown, part of the solution to ensure our survival has to include a change in the meaning of global security. Many consequences that are coming out of climate change will have regional and global geopolitical impacts. Combine a few



of these consequences, such as rising sea levels, increasing food prices, and access to fresh water, and you soon get a “perfect storm” for conflict. Reading this book with a critical military mindset provides the reader with a glimpse of where and in what we might be deploying in the near future.

Environmental refugees resulting from rising sea levels illustrate this point. For example, a six-foot sea-level rise would displace some 15 million Bangladeshis living in the Ganges-Brahmaputra delta. Combine this with the fact that India is currently building a 10-foot (3 meters)-high fence on the shared border to stop illegal immigration from Bangladesh, and you can see how this could create a hot spot for regional security. Also, consider that Bangladesh is ranked third with 62 million potential climate refugees after China with 144 million and India with 63 million.

Another example provided by Brown, illustrating the timing on how climate changes will impact global security, relates to the 2010 heat wave that hit Moscow, the hottest in recorded history. This heat wave of 14 degrees Celsius above average resulted in a 40 per cent shortfall in Russia’s harvest, costing the world some 40 million tons of grain. If this heat wave had hit the much larger United States grain harvest, it would have cost the world some 160 million tons of grain. Such a shortfall would have reduced the carry-over stocks from the normal 79 days of world consumption down to 52 days, well below the 62 days that tripled the world grain prices in 2007–08. Throwing into the mix the failed or failing states relying on grain imports to feed their people again demonstrates how global security can be affected by climate changes. Furthermore, this hypothetical scenario could very well occur anytime.

Why the need to change the definition of global security? Consider that the traditional definition has pushed India and Pakistan into spending millions to develop a nuclear arsenal. Pakistan’s nuclear weapons were of no

help during the massive floods of 2010, when the Indus River overflowed, partially due to heavy rainfall, but also to increased glacier melting. Also contributing to this destruction are the 185 million people condensed into an area 8 per cent of the size of the United States, which means that 90 per cent of the original forests are gone, leaving no capacity to absorb the rainfall and prevent run-off. By considering consequences of climate changes in global security, nations are more likely to direct funding from the conventional military definition of security to address these issues.


Part one of this book is a series of demonstrations of the effects our human footprint is having on the planet. These include pressure on water resources, harvests, soil erosion, rising temperatures, and melting ice. Part two focuses on the consequences and potential reactions from nations that could implement protectionist policies, and on the impacts of environmental refugees.

In part three, solutions are proposed in a master plan—Plan B—which is broken down into four components: a massive cut in global carbon emissions of 80 per cent by 2020; the stabilization of the world population at no more than 8 billion by 2040; the eradication of poverty; and the restoration of forests, soils, aquifers, and fisheries. This plan was outlined without considering the politically acceptable, instead focusing on what was needed to have any hope of saving the Greenland ice sheet and some of the largest glaciers in the Himalayas and Tibetan plateau. The measures advocated are quite drastic, including a global stop to deforestation, elimination of fossil fuel dependence, and an increased use of renewable energy sources.

Finally, part four, consisting of the book’s last chapter, is a plea for mobilization. The first part of the plea is to economists to consider the indirect costs associated with our lifestyle and factor it into market prices. The prime example of this would be the implementation of a carbon tax. Those indirect costs are adding

up and we are soon going to have to pay the bill. Brown concludes by stating that for Plan B to actually happen, we need more than individuals doing their parts. What is needed is for the public to get politically involved.

To conclude, Brown provides a glimpse of what types of military involvement will be required by the international community in these new hot spots created by the consequences of climate changes. If you are short on time, I recommend reading the preface and the first chapter as they provide a good summary of the key issues. An electronic copy of the book can be downloaded at no

cost from the Earth Policy Institute's website at www.earth-policy.org, under the publication heading. 

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THE AGE OF AIRPOWER



By Martin Van Creveld

New York:
PublicAffairs, 2011
498 pages
ISBN 978-1-58648-981-6

Review by

Second-Lieutenant Crystal Parsisson

From its humble origins in the 1700s, air power has developed from balloons and airships to missiles and unmanned aircraft (UA). Since the inception of airpower as an instrument of war it has been utilized in a myriad of military tasks. Such roles include: interdiction, close air support, strategic bombing, insertion and extraction of troops, medical evacuation, liaison, resupply, reconnaissance/intelligence, communications, identification, tracking, targeting, and electronic warfare. However, modern aircraft are becoming increasingly burdened with ever increasing costs associated with procurement, maintenance and repair, additional (add-on) equipment requirements, and the need for much larger and more complex ground facilities. It is due to these growing problems

and the perceived declining usefulness of air power in the most common type of war today (counter-insurgency) that Creveld foresees the demise of modern air forces.

The Age of Airpower is a non-fiction social commentary on the effectiveness of military air power. With a highly cynical tone, Creveld employs a vast knowledge of military history to propose that the effectiveness of air power has undergone a steady decline since peaking during the Second World War (WWII). With particular attention on the world wars, the Sinai, and Vietnam, the book provides the reader with a topical history lesson on the use of air power in various conflicts since the 1700s. Structured into five parts, the first four sections focus on conventional warfare, and the last on counter-insurgency.

With respect to conventional warfare, it is highlighted that during WWII, any large-scale military operation (both on land and at sea) had no hope of success without proper coverage and support from the air. Aircraft carriers were the backbone of the American navy, with all other ships serving to protect and support them. However, this would change with the entry of nuclear weapons in 1945. Creveld argues that although nuclear weapons, in effect, revolutionized air power, the introduction of these weapons also called into question the supremacy of air power, as



the complete jurisdiction over nuclear arsenals was withheld from air forces. This represented a shift where nuclear weapons took over from air power as the dominant factor in war. Nuclear deterrence led to the end of large-scale military operations conducted by powerful nations against each other, with subsequent hostilities being waged only in a limited manner or by proxy. Creveld repeatedly looks to naval air warfare to support his theory on the regression of air power. He points out that since WWII, naval air warfare has been in a steep decline, with numbers of aircraft and carriers being reduced steadily since peaking in 1944. Delving into various wars of the cold war era, Creveld deduces that air power was most often not the deciding factor. Instead, the fear of nuclear escalation has led to conventional warfare being rapidly replaced by guerrilla warfare, in which air power has a history of difficulties.

After the cold war, there was in effect a “military revolution,” with a shift from fighting an enemy that threatened one’s existence to an enemy that threatened one’s interests. At the same time, the aim of military operations shifted from killing as many as possible to killing as few as possible. In counter-insurgency, air power is extremely useful for reconnaissance/intelligence, liaison, resupply, and medical evacuation, but has often been seen as ineffective for influencing overall outcomes. Aircraft have historically been more effective in conventional warfare than counter-insurgency in countries of large size and rough terrain. Some factors that prove problematic for aircraft performing counter-insurgency operations include: difficulty locating insurgents, aircraft limitations (inability to loiter, limited ability to carry and aim ordnance, insufficient night capabilities, excessive speed, lack of manoeuvrability), inability to hold and defend ground, vulnerability to small-arms fire, and the reality that the most capable and costly aircraft are often superfluous. Creveld explains in detail how Vietnam was a failure of air power to bring decisive results while

costing a vast amount of money. He comments that Afghanistan also saw a failure of air power to do its job and has similarities to Vietnam. Consequently, when the first counter-insurgency doctrine was released in 2006, it diminished the role of air power to indirect rather than direct contributions. The reduced effectiveness of aircraft manifests itself as manned vehicles were swapped for missiles, satellites, and UA, the jurisdiction of which is questionable. Indeed, Creveld goes on to promote the idea that air forces should be disbanded, with the remaining useful manned aircraft (helicopters and transport airframes) being placed under the service that they support. Topping off the argument that air power is on a downward spiral, Creveld chooses to end his book with a discussion about women in the military. He blames the increasing presence of women in the air force as the “cardinal reason” why its entire culture is being made more kind and gentle. The reader is then left with the thought that modern pilots are more likely to be charged with sexual harassment than shot down in combat. It is unclear why Creveld deemed it necessary to end his volume with an attack on women in uniform, since it comes across as out of context and quite gratuitous.

Overall, the historical discussion in *The Age of Airpower* is satisfying, although many details are left out for the sake of cramming three centuries of conflict into 498 pages. For the same reason, Creveld attempts to share an abundance of historical concepts through the use of many run-on sentences that require another read to follow. Certainly, the 20 pages of bibliographical notes attest to the vast scope of the material. Not unexpectedly, the book is very United States-centric, with Creveld repeatedly stating how the United States provides a model for the rest of the world to follow. While he also gives credit to Britain and Israel, there is practically no Canadian content. The illustration section is a nice addition and provides pictures ranging from Zeppelins in 1905 to modern-day images of F-22s and drones. On the whole, *The Age of*

Airpower is an intriguing work and while it explores several controversial topics, it would be relevant to anyone with a vested interest in military air power. 🇨🇦

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Abbreviations

UA unmanned aircraft

WWII Second World War