

# CANADIAN FORCES AEROSPACE DOCTRINE



National  
Défence

Défense  
nationale

Canada



## Issued on the authority of the Chief of the Air Staff

Commander 2 Canadian Air Division /  
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CANADIAN FORCES  
**AEROSPACE  
DOCTRINE**



## FOREWORD

Canada's Air Force is an instrument of national policy and an element of national power. As an integral component of the Canadian Forces, Canada's Air Force delivers aerospace power to control and exploit the air and space environments in order to contribute to Canadian security and national objectives.

Much like the first edition of *Canadian Forces Aerospace Doctrine*, this second edition provides context to the vision that air forces exist to exercise aerospace power on behalf of the nation. It also articulates the fundamental and enduring principles of aerospace power for use as guidance in peace and war. So, why is this updated manual needed?

When I joined the Canadian Forces 33 years ago, it was believed that a career in the Canadian Forces would be spent fighting against a single adversary. I knew my role and I had my orders. Then, the world changed. And, it continues to change. The Air Force is doing things today that no one could have even begun to imagine as a young pilot. Nevertheless, as the world changed and continues to change, doctrine must also evolve in response to new experiences, threats, and further advances in technology.

To that end, the Canadian Forces Aerospace Warfare Centre has examined and updated our Air Force's doctrine. The Centre has gathered information from lessons learned and international forums, remained engaged with worldwide aerospace power developments, and explored new concepts and policies that would lead to increased interoperability with our Army and Navy, as well as our international coalition partners. Reviewing the current doctrine focused efforts on setting the conditions that would ensure continued operational success. Bottom line: this updated *Canadian Forces Aerospace Doctrine* is the new guide. It has evolved and changed. Most importantly, it is relevant today.

The primary change in this second edition is the grouping of Air Force capabilities under one of six functions: Command, Sense, Act, Shield, Sustain, and Generate. This aligns the Air Force functions with those used by the Chief of Force Development and promotes better understanding and interaction at the joint level. Each function can be expanded into a hierarchical matrix of Air Force capabilities, roles, missions, tasks, and activities. As such, this manual is the de facto foundation upon which every Air Force activity is based.



It is fundamental that each member of the Air Force comprehend the essence of doctrine and the operational impact of the Air Force functions. Commanders and supervisors at all levels of the Air Force are well advised to read, understand, and apply doctrine. Moreover, it is a professional obligation to ensure that the training and the operational activities of our units are aligned with the principles, characteristics, and tenets espoused in this handbook. By adhering to *Canadian Forces Aerospace Doctrine*, the Air Force will continue to build upon its considerable successes and the tradition of excellence in service to Canada.

*Sic Itur Ad Astra*



A handwritten signature in blue ink, appearing to read 'J. P. A. Deschamps', with a stylized flourish at the end.

**J. P. A. Deschamps**  
Lieutenant-General  
Chief of the Air Staff / Commander Air Command

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# CHAPTER 1

## INTRODUCTION TO DOCTRINE

*In the absence of sound doctrine that you have developed yourself, someone else will decide how your forces will be deployed and employed.<sup>1</sup>*

**- Major-General J. J. C. Bouchard**

*CF Photo: MCpl Angela Abbey*

<sup>1</sup> Lieutenant-General J. J. C. Bouchard, then Major-General, interview with Lieutenant-Colonel J. P. Blais, Winnipeg, December 2006.



## DOCTRINE DEFINED

Military doctrine is the foundation upon which every aspect of military activity is based. A sound doctrinal framework provides commanders guidance and permits individuals to think and act more clearly while engaged in conflict. The missions and tasks executed by military forces are derived from doctrine. Doctrine is also instrumental in establishing priorities for procurement and acts as a critical sounding board for testing and evaluating new concepts and policies. For these reasons, doctrine is essential to the effective functioning and evolution of military forces.

**DOCTRINE  
PROVIDES THE  
FOUNDATION  
FOR ALL MILITARY  
ACTIVITY**

But what is doctrine? In the North Atlantic Treaty Organization (NATO), doctrine is defined as the “[f]undamental principles by which military forces guide their actions in support of objectives.”<sup>2</sup> Doctrine represents knowledge gained from experience, and although it is authoritative, it requires judgment in application. As such, doctrine is not rigid and is not intended to curtail a commander’s freedom of action.<sup>3</sup> To a degree, doctrine reflects what is being done, and how forces act. As new experience is gained, for example, with technology or against threats, commanders develop new methods of conducting and supporting operations. The Canadian Forces (CF) *Doctrine Development Manual* explains that any departure from the guidance provided by doctrine “should be undertaken only after the doctrine has been considered in light of the particular circumstances of an operation and the doctrine is found to be wanting in some respect.”<sup>4</sup> Departures from doctrine may indicate that the doctrine itself requires amendment. Doctrine is, therefore, not static; to remain relevant it needs to remain in concert with how forces evolve in response to experience, new technologies, and a multitude of other factors. In this way, doctrine must be continuously revalidated and never be considered as dogma.<sup>5</sup>

**DOCTRINE  
EVOLVES IN  
RESPONSE TO  
EXPERIENCE  
AND NEW  
TECHNOLOGIES**

<sup>2</sup> North Atlantic Treaty Organization, NATO Standardization Agency, AAP-6 (2009) *NATO Glossary of Terms and Definitions* (Brussels: NATO Standardization Agency, 2009), 2-D-9.

<sup>3</sup> I. B. Holley Jr., “A Modest Proposal: Making Doctrine More Memorable,” *Airpower Journal* 9, no. 4 (Winter 1995), 14–20.

<sup>4</sup> Canada, Department of National Defence, A-GJ-025-0A1/FP-001, *CFJP A1 Doctrine Development Manual* (Ottawa: Department of National Defence, 2009), 1-1.

<sup>5</sup> *The Concise Oxford English Dictionary* (11th ed.) defines dogma as a set of principles laid down by an authority as incontrovertible.

## MILITARY DOCTRINE

CF doctrine is divided into three levels: strategic, operational, and tactical, as depicted in Figure 1-1. Strategic doctrine sets out the fundamental and enduring principles that guide military forces in conflict. Operational doctrine uses these principles to establish distinct objectives and force capabilities, and to describe the operational environment. Tactical doctrine is guided by the higher levels of doctrine in detailing the proper use of specific weapon systems and other resources in order to execute tasks to achieve a specific aim. Although relatively simple to explain, the boundaries between these levels are not always distinct and can sometimes overlap, depending on circumstance.



**Figure 1-1. Three Levels of Doctrine<sup>6</sup>**

Military Doctrine is also categorized into three distinct types:<sup>7</sup>

**Environment-specific<sup>8</sup> Doctrine** – doctrine that reflects the environments in which military operations take place. Sea power, land power, and aerospace<sup>9</sup> power have distinct characteristics and varying applications that provide complementary contributions to national and multinational military endeavours.

<sup>6</sup> Canada, Department of National Defence, B-GJ-005-000/FP-001, *CFJP 01 Canadian Military Doctrine* (Ottawa: Department of National Defence, 2009), 1-3.

<sup>7</sup> Ibid.

<sup>8</sup> The maritime, land, and air elements of the Canadian Forces are formally referred to as “environments.”

<sup>9</sup> Aerospace, meaning the air and space environments, is used throughout this document to underscore that the Air Force operates, uses, exploits, and is concerned with both environments.

**Joint Doctrine** – doctrine that provides the fundamental principles that guide the employment of forces of two or more environments in coordinated action toward a common objective.

**Combined Doctrine** – doctrine that describes the best way to integrate and deploy national forces of more than one nation in coalition or alliance warfare, such as NATO doctrine.

The relationships between the categories of doctrine are illustrated in Figure 1-2. The CF doctrine hierarchy originates with the capstone manual, *Canadian Military Doctrine*. Each environment has its own capstone manual and this document is the capstone for aerospace doctrine. Doctrine publications immediately below the capstone level are referred to as keystone manuals. These operational-level manuals are further amplified through appropriate tactical doctrine publications, such as tactics, techniques and procedures (TTP) manuals. To facilitate interoperability, CF military doctrine must be as consistent as possible with the doctrine of the United States (US) and other NATO members. It should also take into account ongoing doctrinal development within the armed forces of the United Kingdom, Australia, and New Zealand.<sup>10</sup>



**Figure 1-2. Hierarchy of CF Doctrine**

<sup>10</sup> Doctrine Development Manual, 1-4.

## AEROSPACE DOCTRINE

**Strategic aerospace doctrine** in the CF expresses fundamental and enduring principles that describe and guide the proper application of aerospace power. Because of its fundamental and enduring nature, strategic doctrine provides broad and continuing guidance on how aerospace forces are best organized and employed. CF strategic aerospace doctrine, as promulgated in this capstone document, is the foundation for all other levels of aerospace doctrine and establishes the framework for the effective use of aerospace forces.

**Operational aerospace doctrine** applies the principles of strategic doctrine to aerospace operations to describe the organization of aerospace forces and guide their employment in the context of broad functional areas, distinct objectives, force capabilities, and operational environments. Operational aerospace doctrine is the focus for developing the missions and tasks that must be executed through aerospace operations.

**Tactical aerospace doctrine** applies the principles of operational doctrine when employing specific weapon systems, either individually or in concert with other weapon systems, to accomplish specific tasks. Tactical doctrine considers particular tactical objectives and tactical conditions (such as threats, weather, and terrain), and describes how specific weapon systems are employed to achieve operational effects.

## CANADIAN FORCES AEROSPACE DOCTRINE AUTHORITY

CF aerospace doctrine is developed and promulgated on the authority of the Chief of the Air Staff (CAS). The Commander 2 Canadian Air Division / Air Force Doctrine and Training Division (Comd 2 Cdn Air Div / AFDT Div) is the designated Aerospace Doctrine Authority (ADA) and thus has authority over all aspects of aerospace doctrine. The ADA is also the designated coordinating authority for CF joint and combined doctrine that encompasses Air Force functions. The ADA is assisted in meeting aerospace doctrine responsibilities with the help of the Aerospace Doctrine Committee (ADC) and the Canadian Forces

### DOCTRINE AUTHORITY

CHIEF OF THE  
AIR STAFF



COMMANDER  
2 CANADIAN AIR  
DIVISION / AIR  
FORCE DOCTRINE  
AND TRAINING  
DIVISION



AEROSPACE  
DOCTRINE  
COMMITTEE



CF AEROSPACE  
WARFARE CENTRE

Aerospace Warfare Centre (CFAWC). The ADC is the designated Air Force body responsible for overseeing aerospace doctrine, while CFAWC is responsible for the development, production, and dissemination of all strategic and operational aerospace doctrine, as well as the coordination, production, and dissemination of all tactical aerospace doctrine.<sup>11</sup>



CF Photo: MCpl Craig Wiggins

<sup>11</sup> For a more comprehensive discussion, refer to Air Command Order 8000-0 *Aerospace Doctrine* (Ottawa, Department of National Defence, 2002).



# CHAPTER 2

## CANADA'S AIR FORCE

*The best basis for sound judgement is a knowledge of what has been done in the past, and with what results.*

**- Air Vice-Marshal J. C. Slessor**

## INTRODUCTION

A complete understanding of doctrine requires an appreciation of its historical underpinnings. The history of Canada's Air Force is rooted in the earliest days of military aviation. Shaped by the experiences of two world wars, numerous regional conflicts, and United Nations (UN) operations, the Air Force has unique characteristics based not only on these experiences, but also on Canadian geography, culture, and political heritage. To meet the well-being and security needs of the country, and to keep pace with rapid advances in technology, the Air Force continues to evolve, as does its doctrine, to enable it to operate independently, jointly, or alongside allies and coalition partners. This chapter provides an overview of the evolution of the Canadian Air Force (CAF) and its related doctrine. For those who would like to explore Canadian Air Force history in more detail, a list of references is provided in the footnotes.<sup>1</sup>

## THE EARLY YEARS

Canadian military air power played a significant role in the First World War when Canadian airmen provided both quantity and quality to the Royal Flying Corps (RFC), the Royal Naval Air Service (RNAS), and the Royal Air Force (RAF). For example, although Canada's population represented less than 10 per cent of the British Empire, approximately 25 per cent of all RAF flying personnel were Canadian. In addition, Canadian pilots like Raymond Collishaw and Billy Bishop were among the greatest aces of the war.<sup>2</sup> Furthermore, Canada became a world leader in aircrew training, producing at least 20 per cent of the aircrew reinforcement needs of the British Empire and providing vital assistance to the US just before it entered the war in April 1917.<sup>3</sup>

While Canadians were prominent in tactical level operations, Canada had few senior officers involved in higher command. In contrast to the Army's Canadian Expeditionary Force, which became a symbol of Canada's growing wartime independence, there were few proponents in the Canadian military or government for an independent Canadian air arm. Nevertheless, in the last months of the war, the government felt that the large numbers of Canadians serving overseas in British units merited

1 The following books are also recommended for those who would like to explore Canadian Air Force history more deeply: W. A. B. Douglas, *The Creation of a National Air Force: The Official History of the Royal Canadian Air Force*, vol. 2 (Toronto: University of Toronto Press, 1986); Brereton Greenhous, et al., *The Crucible of War 1939–1945: The Official History of the Royal Canadian Air Force*, vol. 3 (Toronto: University of Toronto Press, 1994).

2 "The Aerodrome." Available online at <http://www.theaerodrome.com/aces/canada/index.php> (accessed October 28, 2010).

3 Hiram Bingham, *An Explorer in the Air Service* (New Haven: Yale University Press, 1920), 11–22.

the formation of a national organization and established a Canadian air force consisting of two squadrons based in England. At the same time a desire to enhance national defence against German submarines operating against Allied shipping off the East Coast of Canada led to the creation of the Royal Canadian Naval Air Service (RCNAS) in Canada. It is from these formations that today's Air Force is descended, highlighting both a domestic and expeditionary heritage. After the war, these organizations disappeared, but there remained some 13,000 trained aviators in Canada whom some believed could form the basis of an "air militia."

In June 1919, an Air Board was created to supervise all air activities in Canada, both military and civilian, and on 18 February 1920, the CAF was reformed as a non-permanent force under the Air Board.<sup>4</sup> On 1 April 1924, the CAF became the Royal Canadian Air Force (RCAF), a permanent force intended to foster commercial applications of the new air technology, a healthy aircraft manufacturing industry, widespread flight training facilities, and an active program of technical research. Based on a national concept of a strong civilian base for air activities, RCAF doctrine emphasized peacetime applications of aviation, especially mapping, forestry patrols, and communications. As a result, early Canadian military pilots were described as "bush pilots in uniform," and the RCAF remained a small organization consisting of permanent, non-permanent, and reserve elements. By regulation, every licensed pilot in Canada was a member of the Reserve.<sup>5</sup>

While the Department of National Defence (DND) was established in 1922 to take over the responsibilities of the Department of Militia and Defence, the Naval Service, and the Air Board, the RCAF did not have the status of a fully independent military service because its headquarters was a directorate within Militia Headquarters. This was not to change until 1938 when the first CAS was appointed to be a coequal with the Chief of the General Staff and the Chief of the Naval Service on Defence Council. This change occurred just in time for the RCAF to become, in a very short period, one of the largest air forces in the world.

During the Second World War, the RCAF expanded to almost 200 times its peacetime strength, from 1,150 all ranks in 1938 to a wartime peak of 206,350 at the end of 1943.<sup>6</sup> In total, 93,844 RCAF personnel served overseas in both RAF and RCAF formations; the majority were operational aircrew supported by approximately another 35,000 Canadian

4 Leslie Roberts, *There Shall Be Wings* (Toronto: Clarke, Irwin & Co. Ltd, 1959), 33.

5 Douglas, 47.

6 Ibid., 138.



ground crew.<sup>7</sup> Within Canada, squadrons and formations operating the Home War Establishment engaged German submarines off the East Coast, participated in combined operations against the Japanese in Alaska, and worked with the US to ensure North American security. At its peak in 1943, there were 37 squadrons engaged in home defence duties.<sup>8</sup> Once again, Canada excelled in aircrew training; the more than 100 British Commonwealth Air Training Plan schools in Canada<sup>9</sup> furnished 44 per cent of the 340,000 Commonwealth aircrew trained between 1939 and 1945.<sup>10</sup> Forces were organized functionally into Commands dedicated to the tasks of training, strategic bombing, air defence, transport, tactical support to land forces, and maritime patrol.

The RCAF accumulated considerable domestic and expeditionary experience in all major air power roles during this period. Of the 48 RCAF squadrons overseas by 1944, 16 were in Bomber Command, 18 (including day fighter, fighter-bomber, fighter-reconnaissance, night fighter, intruder, and air observation post) were with the 2nd Tactical Air Force, 5 were Fighter Command, 5 were in Coastal Command, and another was supporting the 8th Army in Northern Italy. There were also 3 RCAF transport squadrons, 1 operating on the Western Front and 2 in Burma. Based upon its experience, the RCAF had written doctrine for offensive



7 C. P. Stacey, *Arms, Men and Governments: The War Policies of Canada, 1939–1945* (Ottawa: Queen's Printer, 1970), 48.

8 S. Kostenuk and J. Griffin, *RCAF Squadrons and Aircraft*, (Toronto: AM Hakkert, Ltd, 1977), 20.

9 Douglas, 226–67.

10 John Terraine, *The Right of the Line* (London: Hodder and Stoughton, 1985) 258; Douglas, 247.

and defensive air operations to allow for British-Canadian interoperability, and was little different from the RAF's. Offensive doctrine guided those forces engaged in tactical air support, antisubmarine warfare, and strategic bombing. Defensive doctrine was written based upon the extensive experience gained by using fighter aircraft in the air defence role.

## THE COLD WAR

The North Atlantic Treaty Organization created in 1949 was the West's answer to the economic and military threat posed by the Union of Soviet Socialist Republics (USSR) to a war-ravaged Europe. In the fall of 1949, the USSR threatened North America directly when it successfully test-detonated its first atomic bomb and began building a fleet of strategic bombers to carry this strategic weapon. The cold war had begun.

There were two key developments in the Canadian military during this transition from post-war demobilization to its build-up to meet the USSR threat. First, the three services moved from the traditional peacetime force structure of small permanent forces to act as a nucleus for the mobilization of reserves to one that relied on forces-in-being. Although the RCAF through the early 1950s relied heavily upon its reserve and auxiliary components, the RCAF became an increasingly full-time service. The RCAF Regular Force reached an unprecedented peacetime strength of over 3,000 aircraft in 41 squadrons, with personnel strength of 54,000.<sup>11</sup> The second development that affected the cold war RCAF was the decision of the Canadian government to commit itself to three international organizations: the UN in 1945, NATO in 1949, and the North American Air Defence Command (NORAD) in 1958. Although it was under a UN banner that Canada went to war in 1950, from an Air Force perspective, it was the RCAF's commitment to NATO's Integrated Forces of 12 fighter squadrons based in eastern France and southwest Germany, and several Maritime Patrol squadrons based in eastern Canada that took the most effort. The RCAF also provided 11 Regular Force all-weather air defence squadrons as well as personnel to man the various radar formations—PINETREE, Mid-Canada, and Distant Early Warning (DEW) lines—in support of NORAD.

To deal with this expansion, the RCAF organized itself into six functional commands: Maritime Air Command, Air Defence Command, Training

11 J. A. Foster, *For Love and Glory* (Toronto: McClelland and Stewart, 1989), 124; Brett Cairns, "Canadian Military Aerospace Power," (Toronto: Canadian Forces College, nd), 1: 21.



Command, Air Materiel<sup>12</sup> Command, Tactical Air Command, and Air Transport Command. At this point, RCAF doctrine began to diverge from its RAF heritage, as the RCAF began to align its operational procedures, tactics, and communications with its United States Air Force (USAF) partner in NORAD and its other Allies in NATO. At the same time, Air Force support of UN peacekeeping and nationally directed humanitarian assistance grew. In a relatively short period of time, RCAF aircraft and personnel were to be found in Asia, Africa, and the Pacific. As practices in Europe were often markedly different from those in North America, given the broad divergence between mission types, there was no overriding RCAF air power doctrine. During this period the Royal Canadian Navy and the Canadian Army had small but effective aviation branches flying fixed-wing and rotary-wing aircraft. Some of these units trained regularly with the RCAF at the Joint Air Training Centre (JATC) at RCAF Station Rivers, Manitoba, based on concepts of joint operations that had been practiced during the Second World War. The JATC was closed with the unification of the CF.



## UNIFICATION

The RCAF ceased to exist on 1 February 1968 as stipulated in the Canadian Forces Reorganization Act passed in 1967. Aside from removing the last vestiges of British heritage with new uniforms and rank nomenclature, the Act had a dramatic effect on the Air Force's organization. Its assets were distributed among the functional components or commands of the CF: Mobile Command (the army plus ground support aircraft), Maritime Command (the navy plus maritime support aircraft), Air Transport Command, Air Defence Command, and Training Command.

<sup>12</sup> "Materiel" is a military term used to cover all supplies, materials and equipment used in operations. See glossary for official definition.

Canadian aircraft based in Europe came under Canadian Forces Europe, a geographically based command that included all CF units in Europe. From a doctrinal perspective, the elimination of the RCAF also eliminated the processes and institutions for the development and promulgation of air force doctrine. The Air Force Council, previously the authority for approval of air force doctrine, was dissolved. As well, the RCAF Staff College, a key source of air power concepts and doctrine development, and the central repository for air power theory and doctrine publications, was transformed into a unified CF staff college.

What was referred to as “the Air Element” suffered an identity crisis for the next seven years because with unification, unlike the Army and Navy, which kept their separate identities and command structures in Mobile Command and Maritime Command, air assets were dispersed throughout the CF. Some of these problems were solved with the formation of Air Command in Winnipeg on 2 September 1975. Air Command was given responsibility for all Canadian military air assets (“everything that flies”), including policy and standards for training and flight safety. However, operational control (OPCON) of tactical aviation and maritime air units remained with their respective land and naval force commanders. Air resources were organized into functional groups such as Air Transport Group and Air Defence Group. The groups that served the land and maritime components of the CF, 10 Tactical Air Group (10 TAG), and Maritime Air Group (MAG), continued to function as integral operational formations of their respective commands. At the same time, they responded to Air Command for all other requirements, such as administration, professional training, maintenance, career management, and flight safety.

The Air Force entered the 1980s with a sense of renewal. New equipment, such as the CF18 Hornet, the CP140 Aurora, and modernization of the North Warning System, were all seen as indications of the reinvigoration of Canada’s Air Force under Air Command. However, there was very little accomplished to promulgate air force doctrine. Without a coordinating body, by 1981, air doctrine could be found in 58 different documents.<sup>13</sup> To address the problem, the Commander of Air Command (Comd AIRCOM) convened an Air Doctrine Symposium in 1984, consisting of senior officers from every part of the Command. Among other things, the Symposium’s deliberations led to the formation of the Air Force Doctrine Board, which assumed responsibility for the development of the B-GA-400 series of Aerospace Doctrine Manuals.<sup>14</sup>

13 Cairns, 2: 59–60.

14 Ibid., 60.

However, as the cold war came to an end in 1989, there was a sharp reversal in the Air Force's fortunes and a subsequent reduction in personnel and equipment. During the later stages of the cold war, few people recognized the need for coherent air force doctrine. Many believed that since the Canadian Air Force was committed to specific roles in NATO and NORAD, the doctrine of those organizations would suffice. But lacking the guidance of Air Force doctrine, National Defence Headquarters (NDHQ) staffs found it difficult to prioritize the numerous projects that comprised the air portion of the capital budget.

## POST-COLD WAR

By 1994, the government decided to reduce the Canadian Forces from 80,000 to 60,000 Regular Force personnel and to dispose of both equipment and facilities. Along with the other commands, Air Command reduced its level of Regular Force personnel and equipment so that it could fulfil its major assigned roles within a defence budget that had been reduced by one-third. The resulting cuts to staff and equipment saw a major reduction in the number of Air Force personnel and a 50 per cent reduction in aircraft. At the same time, the reductions in Regular Force personnel were offset to a small extent with the increase in the size of the Air Reserve from 1,000 to 3,000 members, or approximately 19 per cent of Air Command's military strength.

This period also saw the Air Force's command structure realigned. In the summer of 1997, the functionally based groups (Transport, Fighter, Maritime, Air Reserve, and 10 TAG) were dissolved, and 14 Training Group was absorbed within Air Command Headquarters. 1 Canadian Air Division was stood up in Winnipeg to exercise operational command (OPCOM) of all CF air assets. At the same time, the Commander of Air Command also became the CAS and was relocated to NDHQ with a small staff. Concurrent with the stand-up of 1 Canadian Air Division, the publication of *Out of the Sun – Aerospace Doctrine for the Canadian Forces* captured the significant restructuring and cultural changes of the 1980s and the 1990s. The 1990s also witnessed the birth of joint CF command and control (C2) structures. This had a major impact on the Air Force, which was assigned an almost exclusively force generation role, except for routine operations. Force employment became the purview of the Deputy Chief of the Defence Staff (DCDS) organization for all contingency operations.

After the end of the cold war, many expected that the “peace dividend” represented by the cuts to the CF would be permanent in a relatively benign international climate. But the events of that decade were to change the view of almost all regarding the nature of the post-cold war world. Instead of a stable and peaceful international community, the loss of the bipolar balance of power brought forth regional and terrorist unrest and conflict on a global scale. Canada’s involvement in the Gulf War, and in the Balkans and other international operations, especially following the 11 September 2001 terrorist attacks, quickly revealed that the cuts to the Canadian military and the years of consistent reduction to the defence budget had severely constrained the military’s ability to maintain the high operational tempo demanded by government commitments.

Cuts notwithstanding, all war-fighting and support communities of Canada’s Air Force became heavily engaged in various domestic and overseas crises during the decade and a half following the end of the cold war. Fighter forces, supported by air-to-air refuelling (AAR), participated in the First Gulf War and in the air campaign to force Serbia out of Kosovo. Airlift forces provided tactical and strategic support to a myriad of deployed and national operations ranging from humanitarian assistance to flood victims in Manitoba and Quebec, earthquake victims in the Far East and Haiti, peace support operations in the Balkans, Africa, and elsewhere, and to supporting combat operations in Afghanistan. Maritime patrol squadrons provided support to national security operations, including drug interdiction operations in cooperation with the RCMP, and they participated in both UN and NATO operations in the Middle East and the Adriatic. Ship-borne helicopter crews supported deployed naval operations worldwide. Tactical aviation crews supported UN missions in Southeast Asia, Central America, Haiti, and rescued flood victims nationally. This non-stop operational tempo validated Air Force doctrine at the tactical level, but placed great stress on the Air Force’s ability to sustain lengthy operations that required continual personnel rotations. The heightened operational tempo also left little time to focus on the Air Force as a form of military power or as a separate institution, which included the development of new concepts, the procurement of new equipment and weapon systems, and the positioning of the Air Force for the next conflict. This reality highlighted the need for the Air Force to evolve and focus efforts on strategic and operational-level doctrine to match its tactical counterpart.

Although tactical doctrine has been developed effectively, it has been without clear direction or reference to higher-level air doctrine since May 2004 when *Out of the Sun* was rescinded without replacement.

To serve as the engine of change for Air Force transformation, the CAS authorized the creation of the CFAWC, which was stood up in October 2005. Among other tasks assigned to the Aerospace Warfare Centre was the publication of a complete series of aerospace doctrine manuals.

The shift to develop a comprehensive suite of Air Force doctrine came at a most apropos time. The acquisition of new equipment, such as the C177 Globemaster, the C130J Hercules, the CH148 Cyclone, the reintroduction of the CH147D Chinook, and the acquisition of unmanned aerial systems (UASs), has underlined the need to examine new methods of employing/sustaining Air Force capabilities. At the same time, the stand up of the Joint Task Force-Afghanistan (JTF-Afg) Air Wing in Kandahar on 6 December 2008 brought a more focused application of Canadian aerospace power in support of Coalition expeditionary operations. The experience gained in operating medium- to heavy-lift helicopters, fixed-wing transport aircraft, and UASs in combat as part of a composite wing will be incorporated into doctrine at all levels.



## CONCLUSION

Throughout its proud history, Canada's Air Force has taken many forms, from a niche air force as "bush pilots in uniform," to one of the largest air forces contributing to the Allied coalition during the Second World War, to the highly professional, combat capable, multi-purpose air force of today. Canadian Air Force doctrine has always been congruent with that of its principal allies, and this congruence is reflected in this manual. Since a strategic goal of the CF today is to achieve seamless operational integration at short notice with our allies, and particularly with US forces, it is likely that this congruence will continue for the foreseeable future. However, congruent doctrine does not mean identical doctrine. Canada's unique geography, history, and culture have shaped its military into a unique force; and, therefore, Canada's Air Force requires doctrine that, while interoperable with our allies, reflects the distinct nature of Canadian aerospace power.



# CHAPTER 3

## NATIONAL SECURITY AND AEROSPACE POWER

*The most basic role of any national government is to protect its citizens and their vital interests.*

**- Canadian Senate Committee on  
National Security and Defence**

## NATIONAL SECURITY

In Canada, national security “is the preservation of a way of life acceptable to the Canadian people and compatible with the needs and legitimate aspirations of others. It includes freedom from military attack or coercion, freedom from internal subversion, and freedom from the erosion of the political, economic, and social values which are essential to the quality of life in Canada.”<sup>1</sup> The fundamental aspects of these national interests are largely enduring, although they may be modified in response to internal and external forces such as those resulting from the terrorist attacks on the World Trade Centre and the Pentagon in the United States on 11 September 2001. Promoting and protecting national interests is the essence of national security, which is inherently the ultimate responsibility of government and is achieved through the adoption of a coherent National Security Policy. The principles and priorities identified in the National Security Policy shape the Canadian Defence policy.

The Canadian Defence Policy provides guidance and objectives to the DND for the development of a sustainable program for the performance of operations. The most recent guidance, the *Canada First* Defence Strategy from 2008, emphasizes a Canadian Defence Policy based on defending Canada, including the Arctic, defending North America, and contributing to international peace and security.<sup>2</sup>

**PRESERVING  
THE CANADIAN  
WAY OF LIFE**

## NATIONAL POWER

National power is the term that describes a nation’s total capability to achieve its national objectives. It encompasses a wide array of interrelated capabilities and includes diplomatic, informational, military and economic elements. To achieve the objectives of national policy, a nation employs those necessary aspects of national power. The successful application of national power involves coordination across many national government departments and agencies and is often referred to as a whole-of-government (WoG) approach.<sup>3</sup>

**NATIONAL  
POWER  
:  
DIPLOMATIC  
INFORMATIONAL  
MILITARY  
ECONOMIC**

1 W. D. Macnamara and Ann Fitz-Gerald, “A National Security Framework for Canada,” *Policy Matters* 3, no. 10 (October 2002): 8, <http://www.irpp.org/pm/index.htm> (accessed October 28, 2010).

2 Canada. Department of National Defence. *Canada First* Defence Strategy, 12 March 2010, <http://www.forces.gc.ca/site/pri/first-premier/index-eng.asp> (accessed October 28, 2010).

3 *Canadian Military Doctrine*, 2-2.

## MILITARY POWER



SEA

LAND

AEROSPACE

## MILITARY POWER

The military element of national power, often referred to as military power, “is the potential of military capabilities that a nation possesses.”<sup>4</sup> It is the instrument of national strategy normally exercised by the government when other means have failed or require reinforcement. Military power consists of three principal forms: sea power, land power, and aerospace power. With the shift towards employing military power within a WoG or comprehensive approach framework, the three forms of military power must be interactive, interdependent, and complementary in order to

ensure success in meeting the objectives of national security and the aims of national strategy.<sup>5</sup> At the same time, each may be effectively employed separately to project military power as required.

## AEROSPACE POWER

Aerospace power is that element of military power applied within or from the air and space environments to achieve effects above, on, and below the surface of the Earth. In its earliest form, aerospace power was used for observation purposes to gain a perspective over the battlefield that was not achievable using surface-based assets. Over time, aerospace power has evolved from being an element of land and sea power to becoming an important and inherently flexible and dominating form of military power in its own right. History has shown that the continued modernization of aerospace weapons, platforms, and delivery systems has heightened the importance of aerospace power in the global balance of power, to the point where aerospace power can be employed independently across the spectrum of conflict.<sup>6</sup> It can be integrated with land and maritime forces to contribute to joint and combined operations, or it can be integrated in a WoG or comprehensive approach.



**Figure 3-1. The Spectrum of Conflict**

<sup>4</sup> Ibid., 2-3.

<sup>5</sup> As part of the WoG effort, it is important to note that military power is complementary and that it is not relegated to a force of last resort.

<sup>6</sup> *Canadian Military Doctrine*, 2-12.



**IN THE EARLY PART OF MAY 1916**, before the big Vimy Ridge battle, in the morning soon after sunrise, the balloon ascended with Lieutenant H. and myself to about 5,000 feet. Everything was at peace except an anti-aircraft gun showing evident anger at an annoying mosquito that was buzzing over enemy country.

That bark was the only sound that made one realize that a tragic war was on. For people with jaded nerves who are perplexed with the ceaseless hurry, bustle, and noise of modern life, I recommend a few hours up aloft in a kite balloon as a tonic and respite from its cares and worries. There is a charming and attractive calm and quietness about the experience that is recuperative and restful.

Of course this is not recommended whilst there is a war on, because the clouds can harbour unseen, unknown terrors and instruments of destruction. For instance, the enemy developed an astonishing accuracy in shelling kite balloons with shrapnel. I have had some uncomfortable half-hours with this kind of attack. This morning in May one shell burst towards our balloon, only one, but it left us guessing as to when the next would be sent over, for the enemy rarely let us off with only one try, but this morning he did. He was kind to us that day.<sup>7</sup>

CF Photo: Sgt Jerry Kean

7 Flight-Sergeant W. S. Lewis, "In a Kite Balloon" in *Everyman at War*, ed. C. B. Purdom (London: Dent, 1930).



**THE 1991 GULF WAR** provides an example of how aerospace power has become an indispensable element of military power by demonstrating how control of the air paved the way for the success of follow-on military operations.

"As hostilities heightened and possible war approached, the CF18 squadron included 24 aircraft and appropriate support personnel. At its peak, the Canadian Air Task Group totaled 750 men and women serving in Qatar. War erupted on January 17, 1991, and lasted until early March 1991. By the end of active hostilities the Canadian contingent had 26 CF18s and a CC137 tanker aircraft stationed in Qatar [as well as five Sea Kings in support of naval operations]. In addition, Canada provided CC130 Hercules and CC137 airlift for all Canadian Forces operations in the Gulf region. During the conflict Canadian fighters fired their first shots since World War II but did not incur any casualties. The Canadian contingent carried out combat air patrols (CAP), sweep and escort missions, ground attack roles, and Sea King reconnaissance. The air power displayed by coalition forces was decisive and effective, setting the stage for a very brief 100-hour ground war."<sup>8</sup>



Photo composite by CFAWC

<sup>8</sup> Canada, Department of National Defence, "The Modern Era: The UN-Iraq Conflict," *Canada's Air Force*, <http://www.airforce.forces.gc.ca/v2/hst/page-eng.asp?id=620> (accessed October 28, 2010).



**IT IS CUSTOMARY IN THE DEMOCRATIC COUNTRIES TO DEPLORE EXPENDITURES ON ARMAMENTS AS CONFLICTING WITH THE REQUIREMENTS OF SOCIAL SERVICES. THERE IS A TENDENCY TO FORGET THAT THE MOST IMPORTANT SOCIAL SERVICE A GOVERNMENT CAN DO FOR ITS PEOPLE IS TO KEEP THEM ALIVE AND FREE.**

**- AIR CHIEF MARSHAL J. C. SLESSOR**

# CHAPTER 4

## FUNDAMENTALS OF AEROSPACE POWER

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

**- Field Marshal B. Montgomery**

## THE NATURE OF CONFLICT

A peaceful relationship between nations is always desirable; however, history has shown that conflict is sometimes unavoidable. Nations wage war to achieve political objectives when all other means to achieve them have failed. It is these political objectives that shape military activities and define the boundaries of conflict. Although advances in technology influence how war is conducted, wars are won or lost by people. Success in conflict is largely a matter of judgement, primarily based on knowledge. While common sense and balanced judgement are indispensable qualities for a successful military commander, these qualities alone rarely ensure success under the rigorous conditions of conflict, the nature of which is unpredictable and chaotic, permeated with danger, exertion, uncertainty, fear, and chance. Therefore, the commander's decision-making ability must be underpinned by a sound knowledge of certain fundamentals and proven principles, which have marked the success of commanders in the past.

## THE PRINCIPLES OF WAR

The Principles of War, as described in Table 4-1, are fundamental guidelines for military action and are the most basic form of military doctrine. They are not laws but rather are simply indicators of action that have proven successful in the past. They are as applicable to the air and space environments as they are to the land and sea environments. With the exception of the principle of Selection and Maintenance of the Aim, which is regarded as pre-eminent, not all Principles of War apply to all situations at all times. The remaining principles are not listed in any particular order of importance. Although the individual principles may vary between nations, the underlying doctrine is generally similar. It is essential to keep these fundamental principles in mind, especially since aerospace power is often exercised jointly with the other forms of military power. To disregard the Principles of War involves risk and has often brought about failure.

SELECTION AND MAINTENANCE OF THE AIM	Every military operation must have a single, attainable, and clearly defined aim that remains the focus of the operation. The aim defines the operation; deviation from the aim dilutes effort and risks failure.
MAINTENANCE OF MORALE	Morale is the most important element in ensuring cohesion and the will to win. It is nurtured through good leadership, sound discipline, realistic training, confidence in equipment, and a sense of purpose.
OFFENSIVE ACTION	Distinct advantage lies with the offence because it confers the initiative, gives freedom of action, and compels the enemy to be reactive rather than proactive.
SECURITY	Security guards vulnerabilities and protects vital interests. It provides freedom to take offensive action and denies this advantage to an opponent.
SURPRISE	Surprise can produce results out of proportion to the effort expended. An opponent surprised is ill prepared, and unable to mount an effective opposition.
CONCENTRATION OF FORCE	It is essential to concentrate superior force at a decisive time and place. Forces should be disposed in a manner which permits them to combine quickly to deliver a decisive blow or to counter an enemy threat when and where required.
ECONOMY OF EFFORT	Resources are always limited, so they must not be wasted. To achieve maximum concentration at the main area of interest (AI), prudent risk may have to be accepted in other areas.
FLEXIBILITY	No plan can accommodate all factors of chance and opposition. Success requires the ability to alter plans to take advantage of opportunities or to counter difficulties.
COOPERATION	Cooperation among elements of a force maximizes its capabilities. It entails a unified aim, team spirit, interoperability, division of responsibility, and coordination of effort to achieve maximum effectiveness.
ADMINISTRATION	No plan or operation can succeed without adequate administrative and logistic support. Scarce resources and critical materiel must be controlled at the appropriate level of command. The most economic and effective use of materiel is required at all times.

Table 4-1. The Principles of War

## CHARACTERISTICS OF AEROSPACE POWER

Aerospace, meaning the air and space environments, defines the environment that surrounds the Earth and extends through the air into space from the Earth's surface. This environment is unique and demands a distinct and considered approach to operations within it. For optimal employment of aerospace power, a fundamental understanding of the following characteristics of aerospace power is essential:

**Elevation.** The capacity to employ aerospace power above the surface of the Earth offers the ability to observe and influence activities on the surface and below the sea.

**Fragility.** Aerospace vehicles tend to be more fragile than surface vehicles, and therefore require special handling to keep them in operation.

**Impermanence.** Typically, aerospace platforms cannot remain aloft indefinitely, and therefore cannot hold a station permanently. This can be offset by committing aerospace platforms in rotation to maintain a posture of relative permanence, or by repeating missions as required.

**Payload.** Payloads of some aerospace vehicles are limited when compared to those carried by maritime and land forces; although, it is possible to compensate for small payloads by using high sortie rates. In addition, a small payload delivered quickly may stabilize a critical situation more effectively than a large payload delivered later.

**Precision.** Aerospace power can be employed with great accuracy and minimal collateral damage because of inherent capabilities provided by precision guided munitions and surveillance satellites.

**Reach.** Aerospace power can be projected globally, unimpeded by surface features such as mountain barriers or water expanses.

**Sensitivity to Environmental Conditions.** Aerospace power is typically sensitive to environmental conditions. Bad weather, for example, creates difficulties with take-offs and landings, navigation, target acquisition, and weapons delivery.

### CHARACTERISTICS

ELEVATION

FRAGILITY

IMPERMANENCE

PAYLOAD

PRECISION

REACH

SENSITIVITY TO  
ENVIRONMENTAL  
CONDITIONSSENSITIVITY TO  
TECHNOLOGY

SPEED

STEALTH

SUPPORT  
DEPENDENCY



**Sensitivity to Technology.** Relatively small innovations in technology can have a significant impact on the effectiveness of aerospace power. Technological advances dictate an ongoing requirement for continuous improvement and development of aerospace forces.

**Speed.** The inherent speed of aerospace vehicles provides a rapid response capability that can be projected over great distances. Speed can also be used to achieve surprise and allows for a reduced time of exposure to hostile action, thus increasing survivability.

**Stealth.** Stealth (tactics and technology) gives aerospace power the ability to be employed with minimal risk of detection, increasing survivability, and allowing for surprise.

**Support Dependency.** Aerospace power requires a high level of technical and logistical support that must be provided from a support base of operations.

## APPLICATIONS OF AEROSPACE POWER

The distinguishing characteristics of aerospace power offer decision makers a diverse range of options to achieve national objectives, making aerospace power as important an instrument for preserving peace and managing crises as it is for waging war. Although not an exhaustive list, aerospace power is ideally suited for the following applications:

### APPLICATIONS

#### SUPPORT

#### OBSERVATION

#### PRESENCE

#### DELAY/DENIAL

#### DIVERSION

#### DISRUPTION

#### DESTRUCTION

**Support.** With speed and reach, aerospace power can provide physical support, such as humanitarian relief or military assistance, around the world.

**Observation.** Elevation gives aerospace power the ability to locate, monitor, and observe dispositions of enemy activity.

**Presence.** The presence of aerospace power as a credible counter-threat can serve as a measure of reassurance and is a considerable deterrent to any potential aggressor.

**Delay/Denial.** Aerospace power can be used effectively to inhibit or prevent aggressors from employing their forces, thus providing friendly forces time to strengthen defences or launch spoiling attacks.

**Diversion.** Aerospace power can be used to influence opposing forces by concentrating attacks in key areas, forcing the enemy to divert resources from otherwise intended purposes.

**Disruption.** Damage inflicted by aerospace power can cause an enemy mental and physical disruption because of resulting confusion, weakened unit cohesion, and vulnerability to follow-on attacks.

**Destruction.** Aerospace power has considerable scope to inflict physical destruction on all types of enemy forces, when and where it is required.

## TENETS OF AEROSPACE POWER

The inherent characteristics of aerospace power make it attractive for employment in diverse and multiple tasks; however, care must be taken to avoid fragmentation of resources and dissipation of effort. To ensure the optimal employment of aerospace power, certain fundamental tenets must be observed. These are referred to as the Tenets of Aerospace Power. While the Principles of War provide general guidance on how to employ military power, the Tenets of Aerospace Power have been developed from past experience to provide specific considerations for the employment of aerospace power.



CF Photo: WO Carole Morissette

## TENETS

CENTRALIZED  
CONTROL AND  
DECENTRALIZED  
EXECUTIONFLEXIBILITY AND  
VERSATILITYSYNERGISTIC  
EFFECTS

## PERSISTENCE

## CONCENTRATION

## PRIORITY

## BALANCE

**Centralized Control and Decentralized Execution.**

Centralized control gives coherence, guidance, and organization to the employment of aerospace power. It is achieved through a single aerospace commander who, informed by a theatre-wide perspective, has the authority to assign the available assets to best achieve the assigned objectives. The aerospace commander is therefore responsible for the control (which includes planning, direction, prioritization, allocation, synchronization, integration, and de-confliction) of all aerospace assets. Centralized control ensures the most efficient use of limited aerospace assets, and permits one commander to confirm all of the requirements and then assign or reassign resources to specific missions, based on changing circumstances and priorities. Decentralized execution, the delegation of authority to subordinate commanders to execute assigned missions, is subject to the commander's intent, the rules of engagement, and the other parameters established by higher command. Decentralized execution allows commanders at all levels to apply their expertise and understanding of local conditions for mission accomplishment, while also fostering initiative and situational responsiveness in a dynamic environment.<sup>1</sup>

**Flexibility and Versatility.** Flexibility and versatility are key to the effective employment of aerospace power. 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, or tactical levels of conflict.

**Synergistic Effects.** The coordinated employment of aerospace power with or in support of other forms of national power can produce synergistic effects that exceed contributions of individual forces employed separately.

**Persistence.** The persistent employment of aerospace power gives a commander influence and presence in an AI. Even though aerospace power cannot occupy terrain or remain in constant proximity, its inherent characteristics of speed and reach allow for the continuous revisiting of targets.

<sup>1</sup> The Air Tasking Order (ATO) embodies command decisions that must be centrally controlled, but decentralized for the operators to execute effectively. It enables the aerospace commander to control theatre-wide aerospace forces in support of the joint force commander's intent. The ATO ensures the integration of aerospace operations theatre-wide to bring forces to bear at the time and location of the commander's choosing. The ATO is centrally planned and developed at the operational level, but its execution is decentralized to subordinate command and control nodes, and tactical-level units.

**Concentration.** Effective employment of aerospace power must achieve concentration of effort and guard against fragmentation of effort in attempts to fulfill the many competing demands of the operation.

**Priority.** Because of limited aerospace resources, prioritization of the demands for aerospace power is essential for the optimization of its employment. Aerospace power is most cost-effective when employed for tasks that give high-value pay-offs.

**Balance.** It is essential to balance the employment of aerospace power with due consideration for the Principles of War and the Tenets of Aerospace Power. It is equally important to balance the impact of accomplishing objectives against the associated risk to friendly forces.



CF Photo: Cpl JF Lauzé





## OPERATION DESERT STORM

Operation DESERT STORM was a multi-phase campaign that followed Operation DESERT SHIELD, the six-month buildup of coalition forces in Saudi Arabia that followed the Iraqi invasion of Kuwait in 1990. After the lapse of a deadline set in UN Security Council Resolution 678 for Iraqi forces to leave occupied Kuwait, the Coalition launched a massive air campaign. The campaign commenced on the morning of 17 January 1991, with more than 1,000 sorties per day. The sorties were launched mainly from Saudi Arabia and the six Coalition aircraft carrier groups located in the Persian Gulf. The Canadian Air Force provided CH124 maritime aviation helicopters to support the blockading fleet and CF18 fighter aircraft for air cover and bombing missions. The air campaign was conceived in three phases.

**Phase 1**, the first five weeks of combat, was an air war. While the ground forces positioned themselves, Coalition air forces mounted air operations consisting of deception operations to focus Iraqi attention on defence and cause them to incorrectly organize their forces. Following this were deep strike operations designed to decapitate Iraqi command and control, and eliminate their ability to reinforce Iraqi ground forces in Kuwait and southern Iraq.

In **Phase 2**, which overlapped the first phase and continued to the end, the Coalition gained undisputed air supremacy over Kuwait. This permitted unfettered attack on Iraqi ground forces to reduce their combat power and destroy reinforcing units.

**Phase 3** began with the ground invasion of Kuwait and Iraq. Coalition air forces fixed Iraqi forces in place to assist armoured force penetration and exploitation of terrain, to destroy key lines of communication, to interdict resupply and reinforcement from Iraq, and to eliminate Iraqi forces in Kuwait. The ground war lasted only four days, a triumph due largely to the success of the air campaign.

*Photo composite by CFAWC*



## TENETS AND APPLICATIONS

<b>CENTRALIZED CONTROL AND DECENTRALIZED EXECUTION</b>	<p>DESERT STORM validated the concept of the joint forces air component commander (JFACC), solving historical problems of fragmented air operations command. Although this concept had been used as early as the Second World War, this was the first conflict in which the JFACC was established formally. Canadian CF18 fighter aircraft were deployed to the Gulf as part of the Canadian Air Task Group Middle East (CATGME).<sup>2</sup> Their initial mission was to provide CAP overhead of the Coalition fleet. Although under the operational control of the Coalition naval commander, CF fighter sorties were incorporated into the daily air tasking order (ATO) issued by the JFACC. This integration permitted the JFACC to exercise centralized control over fighter assets, thereby permitting airspace de-confliction and the provision of a listing of available assets for re-tasking as required, while allowing the CF18s to carry out scheduled CAP responsibilities.<sup>3</sup></p>
<b>FLEXIBILITY AND VERSATILITY</b>	<p>During DESERT STORM, a United States Navy (USN) F-18 was tasked with a ground attack mission. En route to the target, a USN E-2 indicated an enemy aircraft was in the area and re-tasked the F-18 to intercept. The F-18 pilot reconfigured the aircraft and proceeded to intercept and eliminate the air threat, and then switched back to successfully conduct the ground attack mission.</p>
<b>SYNERGISTIC EFFECTS</b>	<p>The air campaign was phased to degrade and destroy Iraqi air defences before attacking infrastructure, thus increasing freedom of action. The coalition ground forces were particularly effective as they advanced into Kuwait and Iraq with close air support. The synergistic effects caused by the initial air attacks, combined with the Coalition ground offensive, resulted in minimizing Coalition casualties while maximizing the destruction of the enemy.</p>
<b>PERSISTENCE</b>	<p>Iraq possessed a highly sophisticated integrated air defence system (IADS) designed with built-in redundancy and flexibility in order to survive an air attack. However, Coalition air forces conducted continuous day and night operations, stealth attacks, and they employed precision guided munitions (PGMs), cruise missiles, drones, attack helicopters, special operations forces, and more to keep constant pressure on the enemy. Through the persistent application of aerospace power the Coalition severely degraded the Iraqi IADS.</p>

2 Jean Morin and Richard H. Gimblett, *The Canadian Forces in the Persian Gulf: Operation FRICTION, 1990-1991* (Toronto: Dundurn Press, 1997), 99.

3 Canadian Forces College, "Control of Air Ops During the Gulf War," unpublished compilation of CF documents in relation to the Gulf War. The document is held at the Canadian Forces College library.

CONCENTRATION	<p>The essence of concentration was realized during the air attacks at the commencement of the Gulf War. In the first 24 hours there were 1400 Coalition sorties. The effect of so much aerospace power being brought to bear in a specific place and time was to overwhelm the enemy.</p>
PRIORITY	<p>A main Coalition campaign objective was to cripple the Iraqi command and control (C2) system in order to paralyze their war fighting capability. However, it was recognized that the defensive capability of the Iraqi IADS had to first be neutralized, so this became the number one priority. Once the IADS was degraded, significant freedom for aircraft action was achieved and the priority was shifted to targeting the C2 system.</p>
BALANCE	<p>After initial Egyptian and Syrian successes during the Yom Kippur war, the Israeli Defence Forces counter-attacked, but without first achieving air superiority. This ineffective balancing of their aerospace resources proved to be very costly as the Israelis lost 60 fighter aircraft during the first week.</p>
SUPPORT	<p>Airlift support for CATGME was provided primarily by CF Hercules and Boeing 707 aircraft deployed from Canada and staging out of Canadian Forces Europe. Additional cargo and passenger requirements were met through a combination of contracted commercial support and on a space-available basis from Coalition nations. The initial rapid deployment of Coalition forces into theatre demonstrated firm resolve.</p>
OBSERVATION	<p>Coalition commanders had an unprecedented level of surveillance and reconnaissance of the battlespace, using satellites, UASs and manned aircraft.</p>
PRESENCE	<p>Coalition air forces consistently covered the entire area of operations (AO): observing and disrupting Iraqi movements, intercepting communications, and destroying forces and infrastructure. This illusion of continual presence was a critical hindrance to Iraqi ability to conduct an effective campaign.</p>

<b>DELAY AND DENIAL</b>	The action of Coalition air forces played a significant role in preventing the Iraqi forces from effective participation. The Iraqi Air Force was rendered ineffective by the threat of being overwhelmed, in many cases refusing to fly or fleeing to neighbouring Iran. Army units, stunned by aerial bombardment, surrendered in large numbers when the ground war began.
<b>DIVERSION</b>	Coalition naval air assets, in conjunction with Coalition ships and marine amphibious units, aggressively demonstrated off the coast of Kuwait, offering the potential of a sea-borne assault. This diversion complicated Iraqi defensive options and made it difficult to concentrate Iraqi ground forces against the Coalition ground assault.
<b>DISRUPTION</b>	Prior to the ground campaign, Coalition air forces attacked the Iraqi Air Force, lines of communication, and command and control infrastructure, thus hampering organization of defences. During the ground offensive the Iraqi Air Force was unable to operate effectively, and ground movement by the Iraqis was all but impossible.
<b>DESTRUCTION</b>	During the initial air campaign, and during the ground offensive, the Iraqi Air Force suffered the loss of many aircraft, airfields, and C2 networks, rendering it incapable of mounting an effective defence. After a prolonged aerial bombardment phase, the Iraqi ground forces had their combat capabilities significantly reduced with entire units rendered ineffective.

**WHEN YOU HAVE NO RELEVANT DOCTRINE,  
THE ARMY AND THE NAVY DO NOT  
UNDERSTAND WHAT YOU DO NOR HOW  
HARD IT IS TO DO IT PROPERLY.<sup>4</sup>**

**- MAJOR-GENERAL J. J. C. BOUCHARD**

<sup>4</sup> Lieutenant-General J. J. C. Bouchard, then Major-General, interview with Lieutenant-Colonel J. P. Blais, Winnipeg, December 2006.

# CHAPTER 5

## THE FUNCTIONS OF CANADA'S AIR FORCE

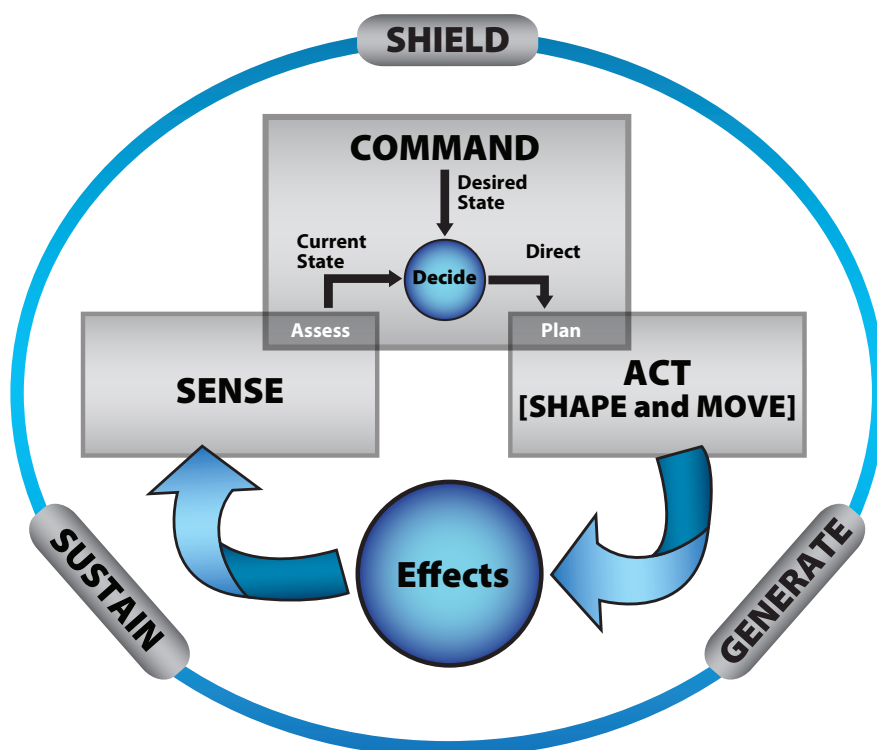
*The only security upon which sound military principles will rely is that you should be master of your own air.*

- Winston Churchill

## AIR FORCE FUNCTIONS

Air forces exist to exercise aerospace power on behalf of the nation. This is accomplished primarily through the exploitation of the air and space environments to achieve assigned objectives. A century of air warfare<sup>1</sup> has demonstrated that all effective air forces, whether they are large or small, are capable of performing a number of specific functions. These functions are influenced by the physical possibilities and limitations imposed by the environments and by each other function. One cannot efficiently or effectively work without the other; however, it is the unique capabilities of each function that when integrated with the other functions ensure the proper application of aerospace power. Aligned with CF doctrine, Canadian aerospace doctrine consists of the following six functions:

**COMMAND • SENSE • ACT • SHIELD • SUSTAIN • GENERATE**



**Figure 5-1. The Air Force Functions**

<sup>1</sup> In today's operational climate, the Air Force must be prepared to simultaneously conduct traditional and irregular warfare operations in any given conflict.



It is important to note that Act comprises the two sub-functions of Shape and Move.<sup>2</sup>

As illustrated in Figure 5-1, in order to conduct aerospace operations and activities, the core functions of Command, Act, and Sense<sup>3</sup> operate within a continuous cycle of activities. The outputs of the Sense activities are assessed during the Command activities to determine the current state. After evaluating the current and desired states, Command activities direct and plan actions. The Act activities create effects that will achieve the desired state. Sense activities assess the results of these effects, and the cycle is repeated. As well, this cycle of activities will influence—or can be influenced by—the ongoing enabling function activities of Sustain, Shield, and Generate.

The Sustain, Shield, and Generate activities must be performed continuously in order to effectively maintain, protect, and develop Air Force assets and capabilities. Without the activities of these functions, the Command, Act, and Sense activities could be compromised or even eliminated. Consequently, a weakness in or failure of one function will negatively impact not only the other five functions but also the force's ability to achieve a desired state.

## COMMAND

Command is the overarching and driving function that integrates all the functions into a single comprehensive strategic-, operational-, or tactical-level concept. Of the six functions, it is universally recognized that Command is fundamental to and of paramount importance to the military art.<sup>4</sup> It provides vertical and horizontal integration through “command” and “control” of military forces and other elements as allocated, and through the command and control activities identified in Table 5-1.

<sup>2</sup> The seven keystone doctrine handbooks should be consulted for a more in-depth discussion on the Air Force functions and its two sub-functions.

<sup>3</sup> The activities of Act and Sense are arguably the reasons that air forces exist. Their conceptual development mirrors that of the evolution of aerospace power itself. Aircraft were specifically developed to Sense, Shape, and then Move. This evolution was based on advances in both technology and a willingness to exploit it. Nations ultimately create air forces to achieve one or a combination of Sense, Shape, or Move.

<sup>4</sup> It is important to note that leadership is essential for the effective application of Command—all commanders must be leaders. Although this handbook will not address leadership per se, it must always be borne in mind that military operations require leadership, and that leadership is indispensable to command. Readings on leadership include A-AP-005-000/AP-003, *Leadership in the Canadian Forces* (Ottawa: Department of National Defence, 2005); and *Sic Itur Ad Astra: Canadian Aerospace Power Studies, Volume 1, Historical Aspects of Air Force Leadership* (Ottawa: Department of National Defence, 2009).

COMMAND	CONTROL
• constitutes formal authority	• derives by delegation from command
• provides oversight, unifying all action	• supports command in detail
• is focused on establishing common intent	• is focused upon the details of execution
Together as “C2” the following five activities are performed:	
MONITORING • ASSESSING • PLANNING • DIRECTING • COORDINATING	

**Table 5-1. Command, Control, and C2**

Command involves the integration of a system of systems—procedures, organizational structures, personnel, materiel, information, and communication—designed to enable any commander to exercise authority and direction across the spectrum of conflict. Commanders will typically work with specialist staff such as public affairs officers, political advisors and legal advisors, and also integrate such considerations into all operations.

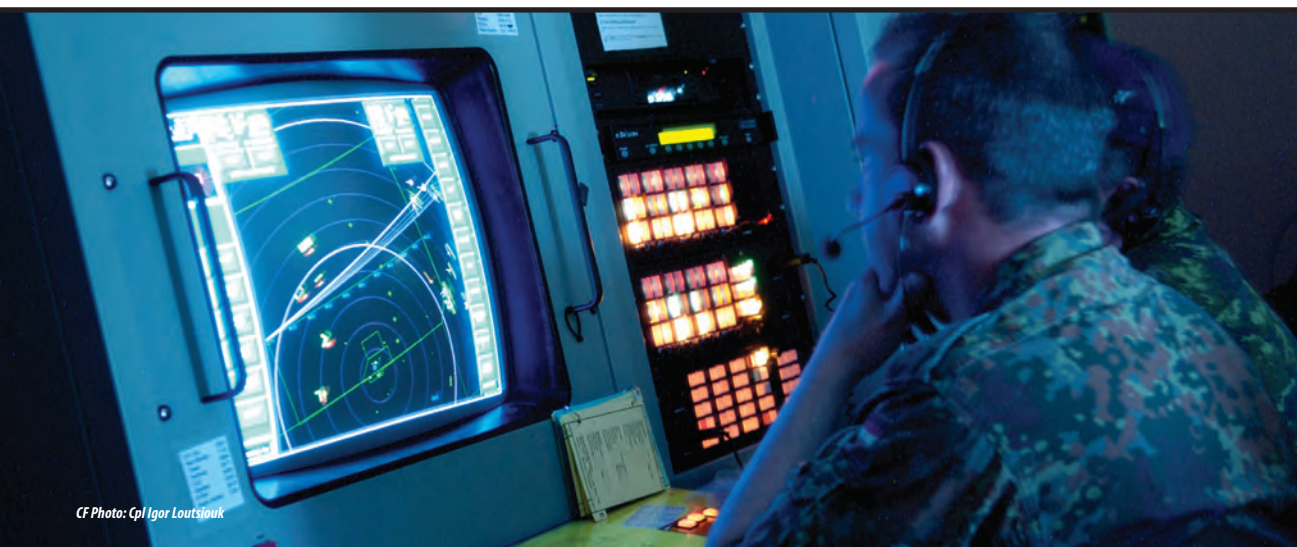
Further discussion on command, control, and C2 of the Air Force is detailed at Chapter 6.

**SENSE**

Sense provides the commander with knowledge.<sup>5</sup> It incorporates all capabilities that collect and process data. The aim of Sense is to enable the decision-makers to achieve decision superiority. Decision superiority is the competitive advantage enabled by ongoing situational awareness that ensures the implementation of more effective and efficient actions than an adversary. In essence, Sense is about providing a perception of the “state of the world” to a commander in order to enable him to make decisions and to optimize the other functions. Sense ultimately provides commanders the knowledge necessary to direct their forces to achieve the most appropriate effect on the operational environment.

All weapon systems which contribute to the creation of a common operating picture are part of the overarching CF Sense enterprise. In the Air Force context, ground-, air- and space-based sensors and radars collect data to contribute to the CF Sense realm. The data collected by a variety of systems is processed by personnel, often assisted by computerized technologies, to create useable knowledge.

5     Moreover, Sense provides each and every decision maker with knowledge.



CF Photo: Cpl Igor Loutsiouk

Modern militaries exploit space capabilities, and air forces are no exception. Space capabilities provide surveillance, reconnaissance, communications, navigation, and meteorological information. Space capabilities are of critical importance to the CF and are increasingly being integrated into all aspects of its planning and operations. Canada's small population, vast and often remote territory, with adjacent ocean areas, including the Arctic, pose unique challenges in terms of exercising control and situational awareness of the land, air, and maritime approaches. As such, space systems are key to helping the military with the function of Sense. Additionally, as Sense provides situational awareness and enables decision superiority, it is essential that space awareness is also integrated into Sense.

The *raison d'être* of Sense is the provision of a perception of the operational environment to decision-makers. In order to achieve this, Sense aims at collecting and reporting on the following:

- elements of the operational environment that the commander does not control, such as actual or potential adversaries, neutral elements, and environmental issues, including weather and terrain; and
- elements of the operational environment that the commander controls, such as their own or allied forces' dispositions via reports and returns from subordinates, certain dedicated sensor applications, including Blue Force Tracker, and from liaison with other forces, other government departments, and international and non-governmental organizations.

## ACT

Act integrates manoeuvre,<sup>6</sup> firepower,<sup>7</sup> and information operations (info ops) to achieve desired effects. Within the Air Force, the Act function “shapes” the battlespace with kinetic and non-kinetic actions, and rapidly “moves” personnel and materiel within and between areas of responsibility (AORs). These actions equate to the two sub-functions of Shape and Move, respectively.

Act also includes the capability of force projection, which is the timely deployment of military forces in order to provide presence or influence for an operation, wherever and whenever needed. Through the range and reach of aerospace power, the projection of forces can be extended beyond fixed bases and installations. Thus, Canada’s influence can be projected to its remotest regions and outside its own territorial boundaries through its global, expeditionary capability.

Force projection is achieved by the rapid establishment of new bases of operation utilizing high-readiness deployable units, by pre-established but unmanned air bases, or by negotiating the use of other nations’ existing infrastructure. The provision of air-to-air refuelling<sup>8</sup> further enables this capability by extending the flight range and loiter time of receiver aircraft, thereby reducing the number of en route stops, maintenance requirements, and, ultimately, the response time.

## SHAPE

Shape optimizes agile manoeuvre and integrated info ops in the delivery of kinetic and non-kinetic aerospace power to achieve desired effects. Shaping of the battlespace by air forces is typically accomplished through the use or the threatened use of force to create effects in both the physical and the moral domains. In the physical domain, actions are directed toward an adversary’s physical capabilities. The objectives of these actions are to:

- deny the enemy their choice of strategy;
- create favourable circumstances to employ our chosen strategy;
- reduce the requirement for other friendly forces; and
- reduce risks, casualties, and cost.<sup>9</sup>

6 Manoeuvre implies a movement of air force capabilities into a position of advantage over an adversary. Aerospace power can manoeuvre to overcome traditional land force limitations of terrain, weather, reach, and is versatile to changing priorities and targets.

7 Firepower refers to the employment of air force capabilities to destroy, neutralize, suppress, or harass an adversary.

8 Doctrinally, air-to-air refuelling is one of the two roles of air mobility, and part of Move; however, air-to-air refuelling also doubles as a critical enabler of Canada’s force projection capability.

9 Air Vice-Marshal Tony Mason, “The Future of Air Power: Concepts of Operations,” *Royal Air Force Air Power Review* 1, no. 1 (1998): 36.

In contrast, actions in the moral domain are aimed at will and cohesion. They involve the use of force or the threatened use of force, as well as incentives or rewards, to cause an adversary to either maintain a desired behaviour or to alter it in a desired manner.

Air Force actions taken to shape the battlespace can be either offensive or defensive in nature and can be applied either directly or indirectly to accomplish assigned objectives. Air forces shape the battlespace by establishing control of the air, accomplishing a strategic effect, supporting land and naval forces, and coordinating info ops.

### **Control of the Air**

Gaining sufficient control of the air is an essential requirement across the spectrum of conflict. Having control of the air safeguards sovereignty in peacetime, controls access to it in times of tension, and provides safety from enemy air attack in war. Moreover, control of the air provides friendly forces with the freedom to conduct operations at the time and place of their choosing without prohibitive interference from an adversary. Consequently, gaining control of the air is normally afforded the highest priority in any military operation.

Depending on the situation and the capabilities of an adversary, control of the air may be established rapidly and maintained at little cost. However, against a capable and resilient opponent, gaining complete control of the air, or “air supremacy,” may be a task of such magnitude that it requires a prohibitive allocation of resources. In such cases, an important consideration for commanders is to balance the cost of favourable air control against the risks created by insufficient control. Therefore, the commander must determine the necessary degree of control of the air required to achieve mission success.<sup>10</sup> Depending on the situation, actions to secure control of the air may be temporary and localized or they may involve ongoing operations throughout the entire battlespace.

Assuring access to space and preserving unhampered exploitation of space capabilities is essential to all military operations. This necessitates operations to guard space assets and associated ground infrastructure. Additionally, operations to prevent an adversary’s hostile use of space capabilities or space effects through denial, deception, disruption, degradation, or destructive measures, as appropriate, may be required.

<sup>10</sup> Achieving control of the air environment prevents the enemy from using air power effectively against friendly forces while allowing friendly use of air power against the enemy. Delaying, disrupting, or destroying the enemy air forces achieves control of the air, which is usually expressed as air superiority or air supremacy. See glossary for definitions of these two terms.



## Strategic Effect

Aerospace capabilities aiming to achieve strategic effect seek to threaten, disrupt or destroy an adversary's strategic centre of gravity.<sup>11</sup> Such operations could involve destructive actions, non-destructive actions, or a combination of both to create effects that directly or indirectly result in the disruption or shattering of an adversary's cohesion, will, or ability to wage war. By simply possessing the ability to conduct such operations, an air force can deter aggression, signal resolve, and reassure allies. When the willingness to conduct air operations for strategic effect is demonstrated through presence or a show of force, these deterrent and reassurance effects are multiplied. For example, air forces can apply force in a controlled and graduated manner to convince an aggressor to cease their undesired behaviour. On the other hand, as a final resort, air forces can conduct near-simultaneous attacks on a multitude of targets aimed at overwhelming an adversary's ability to cope with the scope and pace of attacks, inducing a form of strategic decision-making paralysis.<sup>12</sup> Such activities serve to undermine, disrupt, or destroy an adversary's will or ability to fight.

Ultimately, targets must be carefully selected to ensure direct influence on an adversary's strategic centre of gravity, thereby efficiently and effectively addressing the desired national objective(s) and achieving the desired state.

## Support to Land and Naval Forces

Aerospace operations in support of land forces are conducted to target fielded enemy surface forces and their supporting infrastructure. Such operations will directly lead to strategic effects by denying the adversary's ability to execute a coherent ground campaign. Support to land forces is most frequently associated with direct support to friendly surface forces by the air force. Support to land forces operations may also be conducted independent of surface force objectives or where no friendly forces are present.

Aerospace operations in support of naval forces are conducted to attain and maintain a desired degree of maritime superiority through the destruction, disruption, delay, diversion, or other neutralization of threats

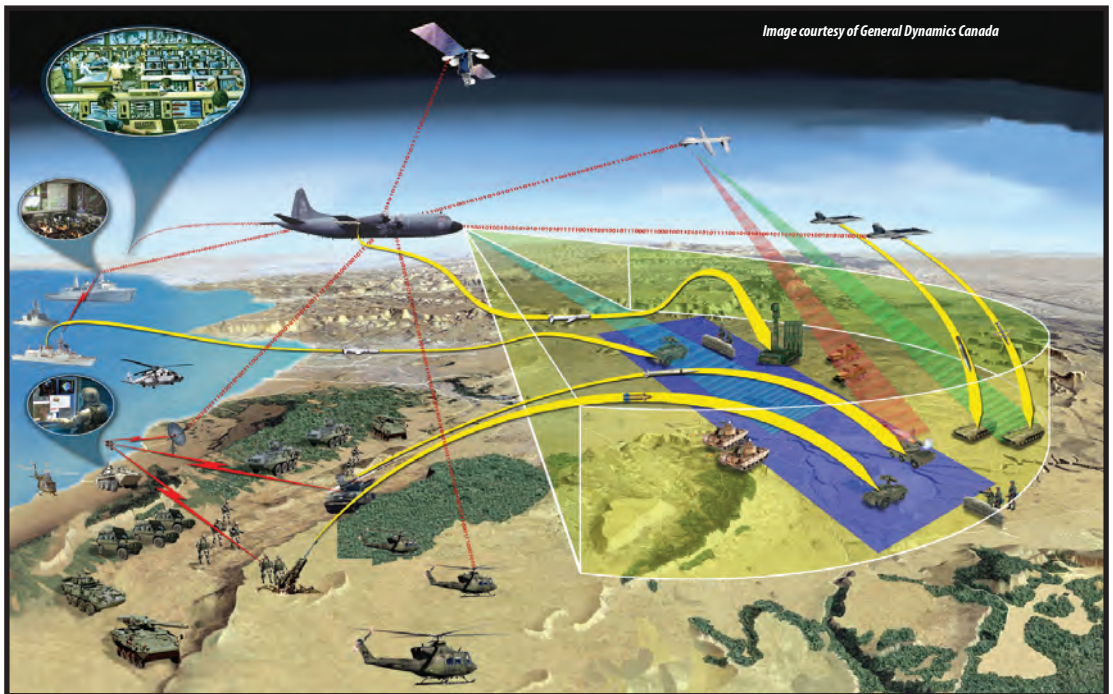
11 The concept of the centre of gravity originates from the writings of Clausewitz, who expressed the concept as meaning "the hub of all power and movement, on which everything depends. That is the point at which all of our energies should be directed." See Carl von Clausewitz, *On War*, ed. and trans. by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984) 595–96. Even today, there remains some debate over how Clausewitz's concept should be translated and interpreted. For example, see Antulio J. Echevarria, *Clausewitz's Center of Gravity: Changing Our Warfighting Doctrine—Again!* (Carlisle, PA: Strategic Studies Institute, September 2002).

12 While this idea was expressed as early as 1954—see United States, AFM 1-8 *Strategic Air Operations* (Department of the Air Force, 1 May 1954), 5—the modern understanding of parallel attack is based on the writings of Colonel John Warden. See, for example, John A. Warden III, "The Enemy as a System," *Airpower Journal* 9, no. 2 (Spring 1995).

in the maritime environment. These operations utilize air forces to counter adversary air, surface, and subsurface threats to enhance the maritime scheme of manoeuvre.

When integrated into a joint force, air, space, and surface forces combine their characteristics in a complementary and synergistic manner (as illustrated in Figure 5-2). By their very nature, Shape operations contribute to joint fires, manipulate the battlespace in support of the attainment of military objectives, and are normally associated with the operational and tactical levels of war. Typically, the air forces' land and naval support roles are applied to:

- curtail interference from hostile land and naval forces;
- inhibit the enemy's ability to manoeuvre;
- deny the enemy an ability to concentrate their forces; and
- disrupt the enemy's command, control, and communications capabilities.<sup>13</sup>



**Figure 5-2. Support to Land and Naval Forces**

<sup>13</sup> Mason, 37.

## Information Operations

Info ops is an integrated process rather than a capability in itself.<sup>14</sup> An understanding of the process will enable commanders to consider and understand the possible effects of their actions and how they can use them to shape the informational domain to maintain or gain an operational advantage.

The info ops process is one of coordination across the informational domain, including the seamless integration of Air Force info ops capabilities and activities into the overall campaign plan. By gaining control of the informational domain, one gains the ability to influence the will and behaviour of one's adversaries while defending one's own. Effects in the informational domain can be created by a variety of military activities, such as psychological operations, computer network operations, or electronic warfare,<sup>15</sup> the close coordination of which will contribute to the achievement of the overall objective. Info ops comprises three interrelated activity areas: influence activities, counter-command activities, and information protection activities.<sup>16</sup> Ultimately, info ops supports the achievement of strategic objectives and contributes to a military operational advantage.

## MOVE

Move exploits the global reach and speed of aerospace power to rapidly deploy and position personnel and materiel to achieve desired effects. As a critical aerospace capability, Move activities are employed across the spectrum of conflict, with or without hindrance from natural or man-made obstructions. There are two capabilities associated with this function: air mobility and personnel recovery (PR).

### Air Mobility

Air mobility is the capability of conducting airlift and air-to-air refuelling roles. It is air mobility's reach, speed, flexibility, and versatility that underpin the Move component of aerospace power.

14 United States, Department of the Army: Military Strategy, Planning, and Operations, *Information Operations Planner*, November 2006, AY07 edition (Carlisle, PA: U.S. Army War College, November 22, 2006), 1.

15 See B-GA-403-002/FP-001, *Aerospace Electronic Warfare Doctrine* (Ottawa: Department of National Defence, interim version) handbook for more information.

16 AJP 3-10 *NATO Information Operations Doctrine*, 2008, RD1, 1-7.

## Airlift

Airlift is the transport and delivery by air of personnel and materiel in support of strategic, operational, or tactical objectives. It provides the military commander with the capability to deploy, employ, and re-deploy forces and equipment quickly and over considerable distances, and to sustain those forces once deployed from their main operating bases (MOBs).

Able to operate globally, airlift can be either strategic or tactical, or both, depending on the nature of the mission. The categorization selected is based on missions assigned and the context in which the missions are conducted. Strategic airlift operations are those operations conducted to move personnel and materiel between theatres.<sup>17</sup> Tactical airlift operations provide commanders the ability to position their forces and equipment within an AOR or AO, while providing them with all required logistical support.

## Air-to-air Refuelling

Air-to-air refuelling (AAR) is the refuelling of an aircraft in flight by an airborne tanker aircraft. As noted earlier, it is one of the key enablers to force projection. The provision of AAR extends the flight range of receiver aircraft, thereby reducing the number of en route stops, maintenance requirements, and, ultimately, the response time to reach their AO. Additionally, AAR enables receiver aircraft to carry a greater payload on departure and to conduct multiple missions as required. Air-to-air refuelling is thus a force enabler, a force multiplier, or both, depending on the mission being conducted.

## Personnel Recovery

Personnel recovery (PR) has applications across the spectrum of conflict, and relies on a comprehensive approach that integrates military, diplomatic, and civil efforts to recover isolated personnel. The roles associated with PR include search and rescue (SAR), combat recovery (CR), combat SAR (CSAR), and non-conventional assisted recovery (NAR). The PR role selected depends on the level of hostilities and the individual training of the isolated person(s).

In peacetime, air force SAR units have the mandate to search for and rescue persons in distress in the air, on land, or at sea. In times of conflict or war, air forces may also conduct CR, CSAR, or NAR, which involve

<sup>17</sup> Some theatres (e.g., Canada) are so large that a “strategic” flight profile may be utilized instead of a “tactical” flight profile, even though the airlift is within the same theatre. Consequently, the terms “inter-theatre” and “intra-theatre” are inappropriate for usage in the Canadian context.



finding and recovering personnel in hostile territory. CR is the recovery of isolated personnel from a hostile environment where interference may be expected. In CR, either the recovery force or the isolated personnel, or both, have not been trained and equipped in the CSAR TTP. CSAR is the application of dedicated, trained forces to recover isolated personnel, who themselves are trained and appropriately equipped to receive this support, from a situation where hostile interference may be expected. At present, the CF does not possess a CSAR capability, and therefore relies on coalition partners to provide this “in-theatre” capability. In NAR, recovery situations may require the assistance of non-conventional forces or other types of assistance when conventional means are not suitable. Such recoveries use special operations forces or other surrogate/indigenous forces trained to assist in moving isolated personnel through a network that returns them to the safety of allied forces.

## SHIELD

Shield protects a force, its capabilities and its freedom of action. It enables the other functions to fulfill their respective roles during operations. A thorough understanding of Shield, including force protection, security risks, cyber threats, and health concerns, is required by all levels of command to enable the commander to address current and future risks, thereby allowing mitigation of such risks to an acceptable level. In addition to its use during conflict, Shield is also required in conflict prevention, mitigation, and post-conflict operations such as reconstruction and nation building.

Air forces engaged in Shield are generally concerned with the protection from attack of vital resources located on air bases, and the minimizing of operational losses by developing strategies and employing personnel and other resources to thwart known threats. Such threats are not constant, as some continually evolve and adapt. The main threat considerations are chemical, biological, radiological and nuclear (CBRN), both deliberate and accidental events, such as aerial threats, psychological threats, cyber threats, and kinetic threats.

Shield must also consider non-combatants, local civilians and dependants, including those located near main operating bases and deployed operating bases. If the shielding of the local population is not considered, then alienation of that population may occur. Such considerations can be divided into the physical, moral, or informational domains.



CF Photo: MCpl Frank Huduc

The physical domain includes consideration of all the kinetic facets across the spectrum of conflict. The moral domain includes psychological threats, morale and unit cohesion, rules of engagement, mission legitimacy, attacks against Canadian interests, and interactions with the local populace. The informational domain includes controlling access and protecting systems and information.

Effective Shield planning and an understanding of all considerations will ensure adequate measures and countermeasures are in place to mitigate the effectiveness of the adversary's efforts and attacks while at the same time affording the operation a considerable measure of safety and an ability to carry out the mission.

## SUSTAIN

Sustain regenerates and maintains capabilities in support of operations. Any deficiencies in the sustainment process could have detrimental impacts on the successful execution of assigned missions. Sustain focuses on the maintenance and regeneration of four components—personnel, materiel,

infrastructure, and services—contributing to the ongoing operational effectiveness of aerospace power. Ultimately, the aim is to ensure that sufficient resources exist at the right time and at the correct destination.

### **Personnel**

The availability and employment of trained personnel, in the right numbers and at the right location, are critical to achieving operational success. The highly technical and complex nature of aerospace operations demands that personnel, whether military, civilian, or contractual, be fully competent and current in the knowledge required to carry out their assigned duties. Individual tasks must be conducted correctly, with due regard for economy and safety. This is critical when dealing with aircraft where a seemingly minor error can quickly lead to the loss of life or a high-value asset.

The Air Force must conduct aerospace operations under military leadership in a disciplined fashion. This places a premium on certain personnel qualities, such as fighting spirit,<sup>18</sup> professional competency, and fitness for duty. These qualities earmark the professional service person and facilitate an ability to lead and thereby provide sustainment that is agile, reliable, and robust.

### **Materiel**

Materiel includes the systems, vehicles, aircraft, arms, parts and materials used to support and maintain aerospace operations. Within Sustain, materiel is allocated and distributed on the basis of need that originates from operational, economic, or political exigencies, and is generally expressed in documents such as statements of operational requirements, post-operation reports, unsatisfactory condition reports, cases for action, and business cases. A key challenge is ensuring that all required materiel is available, visible, and accounted.

The life cycle management (acquisition, use, and disposal) of materiel directly associated with aircraft is subject to higher standards and levels of control than apply for most other materiel. The visibility, accountability, control, movement and delivery of materiel, as well as an understanding of the operation intensity, are major tasks and considerations for the mission support staff.

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18 Fighting spirit is the drive within every military member to do anything in their power, within the ethical principles and values of the profession of arms, to accomplish the assigned mission with enthusiasm, precision and unlimited liability to self, as defined in the *Defence Terminology Bank* (DTB) record 37287, <http://terminology.mil.ca/term-eng.asp> (accessed October 28, 2010).

## Infrastructure

Infrastructure applies to all fixed and non-permanent installations for the support and control of military forces. It includes runways, roads, telecommunication networks, and all types of utilities, such as power generation and electrical distribution, telecommunication ducting, natural gas networks, water and sewage systems, and relocatable temporary camps. The maintenance of existing Air Force infrastructure and MOBs is a major ongoing activity of Sustain, including its updating and modernization in accordance with operational requirements. Similar to materiel, the concept of life expectancy is applied so that plans for demolition can be developed, and construction and maintenance properly sequenced.

Infrastructure sustainment challenges are generally more difficult for short-term operations in remote, austere environments. Because of the dependence of fixed-wing aircraft on runways and other support facilities, there is an ongoing requirement to provide a certain amount of infrastructure to allow the military operation to proceed, but it is more difficult to determine the needs for housing, feeding, warehousing, roads and utilities when the size, scope, and length of the operation are uncertain. In these instances, Sustain solutions tend to favour temporary installations that can be transported, installed, disassembled, and re-used.

## Services

Sustain provides services in the broad areas of engineering, health and welfare, logistics, comptrollership, and aircraft maintenance and engineering. In some instances, such as with construction engineering,



CF Photo: Sgt Roxanne Clowe



electrical and mechanical engineering, and logistics, services bring the other three components of sustainment together at the right place and time. No matter the circumstance, the challenge is to identify the best ways to deliver all services on a continuing basis when the operational situation and tempo, as well as the likelihood of hostile acts, are in a constant state of flux. The attainment of optimal service delivery therefore requires substantial coordination efforts and the ability to react to rapid and significant changes to the operational readiness posture.

It is critical to always keep the complete sustainment process in mind when contemplating changes to unique elements of service delivery. Although individual changes may be logical when considered in isolation, such changes can have drastic consequences if they affect long-standing relationships and/or responsibilities in the overall sustainment process. It is therefore equally important to manage the processes by which a change in service delivery is implemented as it is to justify a change in the first place.

## GENERATE

Generate develops and prepares an aerospace force to meet force employment requirements. This function delivers the capabilities necessary to implement the other five functions. Generating forces to provide aerospace power is an ongoing activity that involves three main elements: developing required force capabilities, conducting force readiness activities, and establishing programmes to prevent the accidental loss or degradation of these capabilities.

### Force Development

The force development process determines the capabilities which the Air Force requires to meet Canada's defence needs, whether domestic or foreign. A number of factors, such as government policy, changes to doctrine, lessons learned<sup>19</sup> from operations, emerging technologies, and the future security environment, all play a part in defining future force capability requirements. Concepts resulting from the introduction of new weapon systems and changes in their employment will also have to be trialed, and policies and doctrine which will govern their employment will need to be developed. Once the necessary capabilities are determined, forces must then be generated; that is, they must be assembled, trained, equipped and structured to effectively perform their associated defence tasks.

19 B-GA-005-780-AG-001, *Air Force Lessons Learned Campaign Plan* (AFLTCP), 3000-1 (CO CFAWC), 7 July 2009, [http://trenton.mil.ca/lodger/CFAWC/AF\\_LL/documents/Air\\_Force\\_Lessons\\_Learned\\_Campaign\\_Plan.pdf](http://trenton.mil.ca/lodger/CFAWC/AF_LL/documents/Air_Force_Lessons_Learned_Campaign_Plan.pdf) (accessed October 28, 2010).

## AIR FORCE SUSTAIN AND GENERATE FUNCTIONS

These two functions, although similar and having concepts that appear to overlap, are indeed quite different. Generate involves the development of capabilities to the point of being ready to be operationally employed; whereas, Sustain involves the effort required to deploy and maintain a force during operations. Generate can also be described as the requirement to increase or decrease the quantity or quality of a capability; whereas, Sustain is the support of a capability at a defined level. Additionally, the Generate force capability development concept involves processes which identify necessary changes to existing capabilities and articulates new capability requirements.

### Force Readiness<sup>20</sup>

Force readiness activities prepare the force in order to respond to government direction. It encompasses the resources needed to maintain equipment, conduct training, and prepare units for force employment, and includes recruiting, training and developing personnel, as well as acquiring the equipment needed to meet Air Force tasks.

### Recruitment, Education and Training

A prime component of force generation is the recruiting, education and training of personnel. This must be done on an ongoing basis to ensure that the Air Force is continually supplied with an adequate number of educated and well-trained people. Government policy, fiscal restraint, technological change, and Canadian culture have at one time or another all impacted on the size, shape, and composition of the Air Force. However, one thing has remained constant—the need for professional airmen, airwomen, and civilians to meet current and future challenges.<sup>21</sup>

### Equipping

Equipping is an activity that ensures air forces have the right tools at the right time to accomplish their assigned tasks. Since interoperability with our defence partners and allies is essential for our Air Force, such acquisition processes require that new materiel takes into account the joint and combined nature of defence capabilities. Such processes include employing new technologies and concepts to maximum advantage by integrating research and development, modeling and simulation, test and evaluation, and the procurement of new systems to meet Air Force equipment requirements.

20 Readiness refers to preparedness to respond to government direction, as defined in the DTB record 34053, <http://terminology.mil.ca/term-eng.asp> (accessed October 28, 2010).

21 More information on how the Air Force Personnel Management System is used to define and manage all Air Force occupation specialties can be found in B-GA-407-001/FP-001, *Air Force Personnel Doctrine* (Ottawa, Department of National Defence, 2010), [http://trenton.mil.ca/lodger/CFAWC/CDD/Doctrine/Pubs/Operational/407\\_Series/B-GA-407-001-FP-001.pdf](http://trenton.mil.ca/lodger/CFAWC/CDD/Doctrine/Pubs/Operational/407_Series/B-GA-407-001-FP-001.pdf) (accessed October 28, 2010).

## Loss Prevention Programmes

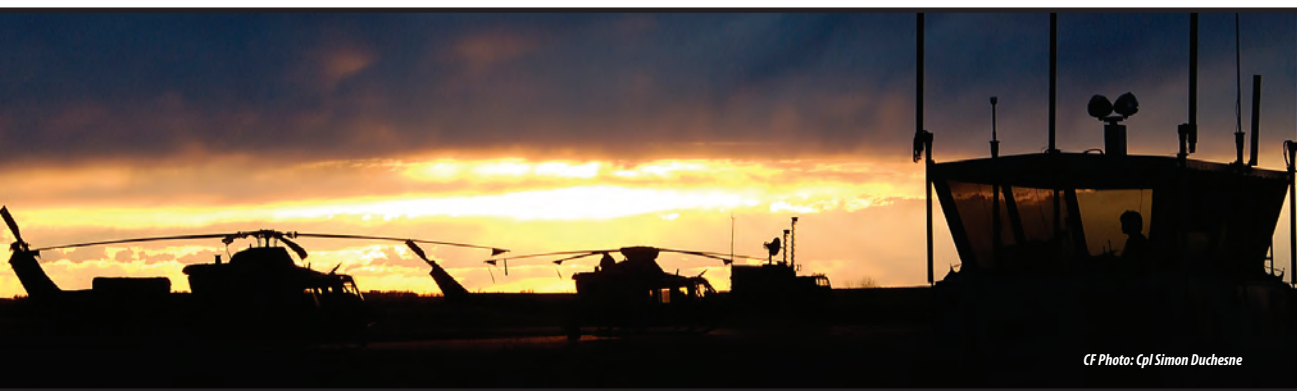
Generating and employing air force assets involves a certain degree of risk which may result in death, serious injury, and loss of equipment, degradation of capability, or damage to the environment. Loss prevention programmes are therefore incorporated and must be considered during the entire life-cycle of any weapon system or other materiel, from introduction through to its employment, sustainment, and, ultimately, during its disposal. There are two main elements to preventing these losses and damages: DND/CF Safety Programmes and the Air Force's Environmental Stewardship programme.

## Safety Programmes

High risk situations will be encountered during routine training exercises as well as during combat missions. A number of DND/CF and Air Force loss prevention programmes are established to ensure that limited resources are not needlessly lost. The Airworthiness, Flight Safety, and General Safety Programmes all contribute to mitigating the accidental loss of Air Force resources throughout a system's life-cycle. These programmes enable the generation and employment of operational capabilities, while reducing the accidental attrition of personnel and materiel.

## Environmental Stewardship

Due to the potential to negatively affect the physical environment during Air Force training and operations, steps have been established to minimize environmental degradation. The CAS's Air Force Environmental Vision and Strategy aims to lessen the impact of air force operations and activities on the environment. This initiative focuses on resolving legacy issues, ensuring compliance with environmental laws, both at home and abroad, and reducing the Air Force environmental footprint through the exploration and implementation of emerging environmental protection and management practices.



CF Photo: Cpl Simon Duchesne

# CHAPTER 6



## COMMAND AND CONTROL OF AEROSPACE POWER

*Order or disorder depends upon organization.*

- Sun Tzu



## COMMAND, CONTROL, AND COMMAND AND CONTROL

Canada's Air Force, like the Army and the Navy, is a vital instrument of national power with inherent responsibilities to protect Canada, Canadians, and the nation's interests and values at home and abroad. The Air Force fulfills its obligations through the effective and efficient projection of aerospace power. Fundamental to these activities is a command and control framework that is flexible and responsive and allows resources drawn from different organizations to operate together toward a common goal.<sup>1</sup> In keeping with this principle, the terms and definitions used in this chapter, unless otherwise noted, are drawn from CF joint doctrine.

### Command

Command is the foundation of all military organizations. It is defined as "the authority vested in an individual of the armed forces for the direction, coordination, and control of military forces."<sup>2</sup> However, command is more than an expression of authority; "[c]ommand is the act of creatively expressing will to accomplish the mission."<sup>3</sup> This definition includes two factors: creativity and will. The commander requires creativity to address and resolve any unanticipated situations that would impede mission accomplishment. Will is also paramount to the commander as it is the decisive factor required to arrive at a decision and to have the determination to act upon it in spite of opposition.

### Control

Control provides a *means* of exercising effective command. Control is that authority exercised by a commander over part of the activities of subordinate organizations, or other organizations not normally under their command. Control is effected by structures and processes devised by commanders to enable command and to manage risk.<sup>4</sup> Aerospace forces make extensive use of control measures in this sense, for example, an airspace control order, or the readiness states on which aircraft are placed.

1 Canada, Department of National Defence, B-GJ-005-300/FP-000, *Canadian Forces Operations* (Ottawa: Department of National Defence, 2005), 2-1.

2 Canada, Department of National Defence, B-GJ-005-300/FP-001, *CFJP 3.0 Operations* (Ottawa: Department of National Defence, 2009), 3-1.

3 Ross Pigeau and Carol McCann, "Re-Conceptualizing Command and Control," *Canadian Military Journal* 3, no. 1 (Spring 2002), 56.

4 Ibid., 54.

Command and Control

Command and control is “the exercise of authority and direction by a commander over assigned, allocated, and attached forces in the accomplishment of a mission.”<sup>5</sup> Effective C2 is fundamental to the efficient employment of aerospace power. C2 activities include the analysis of information, the development of plans, the preparation of orders, the organization and deployment of forces in preparation for conflict, and once operations begin, the coordination and adjustment of the plan’s execution. How forces and entities are grouped—who reports to whom—will directly affect how information flows and command decisions are made. On the one hand, “flatter” organizations will tend to respond more quickly to external events, but be more difficult to direct centrally. On the other hand, separate intermediate headquarters for every activity will allow greater expertise in each area, thereby reducing the span of control of any one headquarters, but creating a more cumbersome, less responsive command system. Such factors need to be weighed carefully when establishing command arrangements. While not the only consideration, the command and control implications are a key factor when determining the organization of an aerospace force or headquarters.

PRINCIPLES OF COMMAND

Experience has revealed that there exist certain fundamental principles in the C2 of forces which are formally articulated as the principles of command:

PRINCIPLE	APPLICATION
UNITY OF COMMAND	A single, clearly identified commander must be appointed for each operation. The commander has the authority to plan and direct operations and will be held responsible for an operation’s success or failure.
SPAN OF CONTROL	Every person has a limited capacity and therefore the assigned resources and activities must be such that one person can exercise effective command or control of the formation or unit.
CHAIN OF COMMAND	The structure of the C2 process is hierarchical and must be respected. Bypassing the chain of command is justified only in the most exceptional circumstances.

5     *Defence Terminology Bank*, record 5950.

<b>DELEGATION OF AUTHORITY</b>	Commanders must be clear when delegating all or part of their authority.
<b>FREEDOM OF ACTION</b>	Once the task or mission has been established and the necessary orders have been given, subordinate commanders must be permitted maximum freedom of action to take initiative and exercise their skills and knowledge of the local situation in the planning and conduct of the operation.
<b>CONTINUITY OF COMMAND</b>	A clear and well understood succession of command is essential.

**Table 6-1. The Principles of Command**

## COMMAND AND CONTROL RELATIONSHIPS

C2 can be exercised at three different levels: full, operational, and tactical.

**Full Command** is the military authority and responsibility of a commander to issue orders to subordinates. “It covers every aspect of military operations and administration and applies to all levels from the [Chief of Defence Staff] CDS down to the unit commander.”<sup>6</sup> It is applicable only within national services; therefore, alliance or coalition commanders cannot have full command over forces of other nations.

**Operational Command (OPCOM)** is the authority granted to a commander to assign missions or tasks to subordinate commanders, to deploy units, to reallocate forces, and to retain or delegate operational control (OPCON), tactical command (TACOM), and/or tactical control (TACON) as necessary. It does not include responsibility for administration.

A commander assigned OPCOM may delegate that authority. While OPCOM allows a commander to assign separate employment to components of assigned units, it cannot be used to disrupt the basic organization of a unit to the extent that the unit cannot readily be given a new task or be redeployed. A commander will normally exercise OPCOM through commanders of subordinate components of a task force.

**Tactical Command (TACOM)** is the authority delegated to a commander to assign tasks to forces under their command for the accomplishment of the mission assigned by higher authority. It is narrower in scope than OPCOM but includes the authority to delegate or retain TACON.

<sup>6</sup> CFJP 3.0 Operations, 3-2.

**Operational Control (OPCON)** is the authority delegated to a commander to direct allocated forces to accomplish specific missions or tasks, which are usually limited by function, time, or location, and to deploy units concerned, and to retain or assign TACON of those units. It does not include authority to assign separate employment of components of the units concerned. Units are placed under commanders’ OPCON so that commanders may benefit from the immediate employment of these units in their support, without further reference to a senior authority.

**Tactical Control (TACON)** is detailed and usually restricted to local direction and control of movements or manoeuvres necessary to accomplish missions or tasks assigned. In general, TACON is delegated only when two or more units not under the same OPCON are combined to form a cohesive tactical unit.

	FULL COMMAND	COMMAND		CONTROL	
		OPCOM	TACOM	OPCON	TACON
PROVIDE ADMINISTRATIVE AND LOGISTIC SUPPORT	X				
ASSIGN SEPARATE EMPLOYMENT OF COMPONENTS OF UNITS/FORMATIONS	X	X			
ASSIGN MISSIONS	X	X		X	
ASSIGN TASKS	X	X	X	X	
DELEGATE EQUAL OR LOWER COMMAND STATUS	X	X	X	X	X
COORDINATE LOCAL MOVEMENT OR ACTION	X	X	X	X	X
PLAN AND COORDINATE	X	X	X	X	X

Table 6-2. Command and Control Relationships



## COMMAND IN THE CANADIAN FORCES

The Governor General is the Commander-in-Chief of the CF and provides the link from the Crown to the armed forces. The Government of Canada provides direction to the CF through the Minister of National Defence. The CDS is responsible to the Minister for the conduct of military operations. By virtue of appointment, the CDS commands the CF and provides strategic direction. The CDS issues orders and instructions through the chain of command, delegates command authority, and assigns missions and tasks to subordinate commanders.

## COMMAND IN THE AIR FORCE

The Commander of Air Command (Comd AIRCOM), who also fills the position of the CAS, commands and provides strategic direction for the Air Force. As the senior Air Force officer in the Canadian military, the Comd AIRCOM is directly responsible to the CDS and acts as an advisor on strategic Air Force issues. The Comd AIRCOM is also responsible for generating and sustaining a combat capable, multi-purpose air force to meet Canada's defence objectives. Two commanders report to the Comd AIRCOM, namely, Commander 1 Canadian Air Division (Comd 1 Cdn Air Div) and Comd 2 Cdn Air Div / AFDT Div.

Comd 1 Cdn Air Div is accountable to Comd AIRCOM and exercises C2 over a multitude of Air Force formations and units. Comd 1 Cdn Air Div acts as the operational airworthiness authority for all CF aerospace assets and provides advice on the C2 construct for aerospace operations to the joint force commander (JFC). Comd 1 Cdn Air Div is also the Canadian joint forces air component commander (JFACC) for CF operations. The JFACC is accountable to the designated supported JFC for force employment of aerospace assets. The JFACC provides advice on the C2 construct for aerospace operations to the JFC. Comd 1 Cdn Air Div is also Commander Canadian NORAD region (CANR) and is accountable to Commander NORAD to exercise operational control over all forces allocated or made available for air defence in the region.

Comd 2 Cdn Air Div / AFDT Div is accountable to Comd AIRCOM and has oversight of Air Force individual education and training, to include ab initio training for most Air Force occupations, core Air Force developmental coursing and related support. The 2 Cdn Air Div HQ and CFAWC support overall Air Force training management and doctrinal development by deriving lessons learned out of collective training, exercises

and operations. The generation of forces for immediate operational employment, including operational training unit/flight oversight and collective training, remains the purview of Comd 1 Cdn Air Div.<sup>7</sup>

## AIR FORCE COMMAND AND CONTROL

Centralized control and decentralized execution is the fundamental tenet of aerospace power as it relates to C2. Aerospace forces need to be organized based on sound command and control principles with the purpose of achieving operational effectiveness across the spectrum of conflict. Centralized control is required to ensure the most efficient use of limited aerospace assets. To best accomplish overall objectives, therefore, aerospace forces are coordinated and directed at the operational level by a single air commander.

Centralized control also allows aerospace action to be refocused quickly to exploit fleeting opportunities, to respond to the changing demands of the operational situation, and to be concentrated at the critical place and time to achieve decisive results. Decentralized execution fosters initiative and situational responsiveness, and provides subordinate commanders with the authority to apply their expertise and understanding of local conditions to accomplish the mission within the guidelines and overall intent of the commander. When integrating aerospace power into joint or combined operations, the JFACC will advise the JFC,<sup>8</sup> the combined force commander, the joint task force commander, or the combined joint task force commander as to the appropriate air C2 structure.

<sup>7</sup> In the current context, force generation and how it relates to the Air Force is understood, but it is difficult to cleanly define. Presently, force generation is most easily defined as a continuum, (which it is), with 2 Cdn Air Div / AFDT Div having clear responsibilities for ab initio / core training, and the generation of forces for immediate operational employment as being the responsibility of 1 Cdn Air Div.

<sup>8</sup> JFCs, such as Comd Canada Command (Canada COM) and Comd Canadian Expeditionary Force Command (CEFCOM), organize forces to accomplish the mission based on their vision and concept of operations, and provide direction and guidance on command relationships.



CF Photo: Cpl Colin Aitken

## POSTSCRIPT

*Canadian Forces Aerospace Doctrine* lays out the fundamental principles behind the employment of aerospace power in support of Canadian security and national objectives. It provides the framework for the application of aerospace power and is the capstone document for aerospace doctrine serving as the guide for the development of operational and tactical doctrine. While it is authoritative, it is not prescriptive. Based on lessons learned from air operations of the past, it provides a solid foundation for dealing with the aerospace challenges of the future. As such, it is not static but will evolve as new lessons are learned and new concepts are developed and proven. As a result, the successful application of this doctrine can only be achieved through the continued engagement of Air Force personnel in the ongoing process of doctrinal renewal and study. In this regard, it is every Air Force member's professional obligation to be fully engaged in the process of discussion and development of doctrine, whether at the strategic, operational, or tactical level.

*Sic Itur Ad Astra*



CF Photo: Cpl Evan Kuelz



## GLOSSARY

The definitions contained in this glossary are derived from a number of sources. Where this publication is the source of a definition, no source is indicated. Definitions taken from other sources are indicated in parentheses at the end of each term, utilizing the following abbreviations:

- a. B-GJ-005 – B-GJ-005-300/FP-001 – *CFJP 3.0 Operations*
- b. DPN – *Defence Policies of Nations: A Comparative Study* – Glossary (Edited by Douglas J. Murray and Paul R. Viotti)
- c. DTB – *Defence Terminology Bank*,  
<http://terminology.mil.ca/term-eng.asp>
- d. JP 1-02 – US Joint Pub 1-02, *Dictionary of Military Terms*
- e. JWP 0-01 – *British Defence Doctrine*

### **aerospace (aero)**

The environment, meaning the air and space environments, that surrounds the Earth and extends through the air into space from the Earth's surface. (DTB Record 34894)

### **Aerospace Doctrine Authority (ADA)**

The designated Air Force staff position with authority over all aspects of the development, production, and dissemination of CF aerospace doctrine.

Note 1: The ADA is the chairman of the Aerospace Doctrine Committee, and coordinating authority for CF joint and combined doctrine that encompasses air force functions.

Note 2: The Commander 2 Canadian Air Division is the designated ADA. (DTB Record 34072)

### **Aerospace Doctrine Committee (ADC)**

The designated Air Force body responsible for overseeing the development, control, and advocacy of aerospace doctrine.

Note: The ADC is established under the authority of the Chief of the Air Staff / Commander Air Command. (DTB Record 34073)

### **aerospace operation**

An activity, or series of activities, related to the planning and application of aerospace power to achieve assigned objectives. (DTB Record 37248)

**aerospace platform**

The vehicles through which aerospace power achieves effect. Aerospace platforms have inherent advantages of speed, reach, and manoeuvrability in comparison with platforms that operate in the maritime or land environments. (DTB Record 34077)

**aerospace power**

The element of military power that is applied within or from the air and space environments to achieve effects above, on, and below the surface of the Earth. (DTB Record 34078)

**Air Force (AF)**

The branch of the armed forces charged with generating and projecting aerospace power in defence of the nation and its national interests and institutions.

Note: Although the Canadian Forces is a unified force comprising a single service, it has become common practice to refer to the three environmental commands as the Navy, Army, and Air Force. (DTB Record 34080)

**air force function**

The set of broad, fundamental, and continuing activities of an air force. (DTB Record 37250)

**air mobility**

The capability of conducting airlift and air-to-air refuelling roles.

**air superiority (AS)**

That degree of dominance in the air battle of one force over another which permits the conduct of operations by the former and its related land, sea, and air forces at a given time and place without prohibitive interference by the opposing force. (DTB Record 3364)

**air supremacy**

That degree of air superiority wherein the opposing air force is incapable of effective interference. (DTB Record 3366)

**air-to-air refuelling (AAR)**

The refuelling of an aircraft in flight by an airborne tanker aircraft.

Note: Air-to-air refuelling is a subset of air refuelling. (DTB Record 37283)

**airlift**

The transport and delivery by air of personnel and materiel in support of strategic, operational, or tactical objectives. (DTB Record 34083)

**area of operations (AO)**

A geographical area, within an area of responsibility, assigned to a subordinate commander within which that commander has the authority to plan and conduct tactical operations. (DTB Record 3528)

**area of responsibility (AOR)**

The geographical area assigned to an operational-level commander within which that commander has the authority to plan and conduct military operations. (DTB Record 34612)

**campaign**

A set of military operations planned and conducted to achieve a strategic objective within a given time and geographical area, which normally involves maritime, land, and air forces. (DTB Record 18743)

**capstone manual**

A manual of overarching importance within a hierarchy of manuals that deals with the fundamental aspects of a broad subject matter, and having precedence over all other manuals within that subject regardless of sub-domain. (DTB Record 32223)

**centre of gravity (COG)**

Characteristics, capabilities, or localities from which a nation, an alliance, a military force, or other grouping derives its freedom of action, physical strength or will to fight. (DTB Record 324)

**coalition**

An ad hoc agreement between two or more nations for a common action. (DTB Record 21755)

**combat operation**

A military operation where the use or threatened use of force, including lethal force, is essential to impose will on an armed opponent or to accomplish a mission. The actual level of force used will be in accordance with specified rules of engagement. (DTB Record 21754)

**combat recovery (CR)**

The recovery by conventional forces of isolated personnel from a situation where hostile interference may be expected.

Note: In CR, either the recovery force, or the isolated personnel, or both, have not been trained in combat search and rescue tactics, techniques, and procedures. (DTB Record 36629)

**combat search and rescue (CSAR)**

The application of specific tactics, techniques, and procedures by dedicated forces to recover isolated personnel, the latter being trained and appropriately equipped to receive this support, from a situation where hostile interference may be expected. (DTB Record 18744)

**combined**

Adjective used to describe activities, operations, and organizations in which elements of more than one nation participate. (DTB Record 18750)

**command**

1. The authority vested in an individual of the armed forces for the direction, coordination, and control of military forces. (DTB Record 27866)
2. An order given by a commander, that is, the will of the commander expressed for the purpose of bringing about a particular action. (DTB Record 27867)
3. A unit or group of units, organization, or area under the authority of a single individual. (DTB Record 23382)

**command and control (C2)**

The exercise of authority and direction by a designated commander over assigned forces in the accomplishment of the force's mission. (DTB Record 5950)

**comprehensive approach**

The application of commonly understood principles and collaborative processes that enhance the likelihood of favourable and enduring outcomes within a particular situation.

Note: The comprehensive approach brings together all the elements of power and other agencies needed to create enduring solutions to a campaign. These may include: military (joint and multinational forces), Canadian government departments and agencies (whole of government), foreign governments and international organizations (e.g., NATO and UN), and publicly funded organizations (e.g., NGOs). (DTB Record 34522)

**contingency operation (CONOP)**

A deliberate operation planned in advance of a known event or an event that could reasonably be expected. (DTB Record 22309)

**control**

1. That authority exercised by a commander over part of the activities of subordinate organizations, or other organizations not normally under



[their] command, which encompasses the responsibility for implementing orders or directives. All or part of this authority may be transferred or delegated. 2. That authority exercised by a commander over the activities of organizations not normally under [their] command, which encompasses the responsibility for implementing orders or directives. (DTB Record 375 modified)

### **doctrine**

Fundamental principles by which the military forces guide their actions in support of objectives. It is authoritative but requires judgement in application. (DTB Record 1761 modified)

### **environment**

Either the Navy, Army, or the Air Force. (B-GJ-005)

### **force**

1. An aggregation of military personnel, weapon systems, vehicles and necessary support, or combination thereof. 2. A major subdivision of a fleet. (JP 1-02)

### **force development (FD)**

A system of integrated and interdependent processes that identifies necessary changes to existing capability and articulates new capability requirements for the CF. It is driven by changes in policy, actual or projected, changes in the security environment, and lessons learned from operations. Force development comprises capability based planning, capability management, and capability production. (DTB Record 32172)

### **force employment (FE)**

1. At the strategic level, the application of military means in support of strategic objectives. 2. At the operational level, the command, control and sustainment of allocated forces. (DTB Record 32173)

### **force enabler**

A capability provided to a combat force that is essential to mission accomplishment.

### **force generation (FG)**

The process of organizing, training and equipping forces for force employment. (DTB Record 32171)

**force multiplier**

A capability provided to a combat force that enhances the probability of success in mission accomplishment.

**force protection (FP)**

All measures taken to contribute to mission success by preserving freedom of action and operational effectiveness through managing risks and minimizing vulnerabilities to personnel, materiel, facilities, information and activities from all threats. (DTB Record 23554)

**informational domain**

The sphere in which information and data reside.

**integration**

The combination of military and non-military elements to achieve a common goal through coordinated and complementary efforts. (DTB Record 34192)

**intelligence (int)**

The product resulting from the processing of information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations. The term is also applied to the activity which results in the product and to the organization engaged in such activity. (DTB Record 738)

**interoperability**

The ability to act together coherently, effectively and efficiently to achieve common objectives.

Note: Interoperability may be achieved through the compatibility of doctrine, processes and materiel. (DTB Record 32228)

**irregular warfare**

A violent struggle among state and non-state actors for legitimacy and influence over the relevant populations.

Note: Irregular warfare favours indirect and asymmetric approaches, though it may employ the full range of military and other capabilities in order to erode an adversary's power, influence, and will. (JP 1-02)

**isolated personnel**

Military or civilian personnel who are separated from their unit or organization in a situation that may require them to survive, evade, resist, and/or escape while awaiting recovery.

Note: Applicable civilians are as designated by national authorities responsible for deploying individuals/personnel. (DTB Record 37299)

**joint**

Adjective used to describe activities, operations and organizations in which elements of at least two services [i.e., environments] participate.

Note: When all services are not involved, the participating services shall be identified. (DTB Record 35248)

**keystone manual**

A manual of seminal importance under an overarching capstone manual within a hierarchy of publications that deals with the fundamental aspects of a specific subject matter, and on which are based related supporting manuals published in the same field. (DTB Record 32229)

**leadership**

1. The art of influencing human behaviour so that subordinates willingly carry out orders to effectively accomplish military missions. 2. Influencing people to achieve a mission. (DTB Record 34085 modified)

**logistics (log)**

The science of planning and carrying out of the movement and maintenance of forces. In its most comprehensive sense, those aspects of military operations which deal with design and development, acquisition, storage, movement, distribution, maintenance, evacuation and disposition of materiel. (DTB Record 15760)

**materiel (mat)**

All public property, other than real property, immovables and money, provided for the Canadian Forces or for any other purpose under this Act, and includes any vessel, vehicle, aircraft, animal, missile, ammunition, clothing, stores, provisions, or equipment required. (DTB Record 864)

**military power**

An instrument of national power that uses force, threat of force or other inherent capabilities to achieve national objectives. (DTB Record 35266)

**mission**

The essential activities assigned to an individual, unit, or force. It contains the elements of who, what, when, where, and the why (reasons therefore), but seldom specifies how. (DTB Record 26667)

**moral domain**

The sphere in which people interact on a psychological, ethical, and/or cognitive level.

**national interests**

A generalized concept of elements that constitute a nation's compelling needs, including self-preservation, independence, national integrity, military security and economic well-being. (DPN)

**national objectives**

The aims, derived from national goals and interests, toward which a national policy or strategy is directed and efforts and resources of the nation are applied. These may be short-, mid-, or long-range in nature. (JP 1-02)

**national power**

The sum total of a nation's capabilities or potential derived from available political, economic, military, geographic, social, scientific and technological resources.

Note: Leadership and national will are the unifying factors. (DTB Record 35209)

**national security**

The condition achieved through the implementation of measures that ensure the defence and maintenance of the social, political, and economic stability of a country. (DTB Record 31720)

**national strategy**

The art and science of developing and using the political, economic, and psychological powers of a nation, together with its armed forces, during peace and war, to secure national objectives. (DTB Record 35112)

**non-conventional assisted recovery (NAR)**

The recovery by non-conventional forces of isolated personnel from a situation where hostile interference may be expected.

Note 1: Non-conventional forces include special operations forces, indigenous forces, and surrogates.

Note 2: In NAR, the isolated personnel have not been trained in combat search and rescue tactics, techniques, and procedures. (DTB Record 37300)

**operation (Op)**

1. A military action or the carrying out of a strategic, operational, tactical, service, training, or administrative military mission. 2. The process of carrying on combat, including movement, supply, attack, defence and manoeuvres needed to gain the objectives of any battle or campaign. (DTB Record 1053)

**personnel recovery (PR)**

The sum of military, diplomatic and civil efforts to effect the recovery and reintegration of isolated personnel.

Note: The elements of PR include command and control, recovery forces, preparation, reintegration teams, isolated personnel, and their next of kin. (DTB Record 31303)

**physical domain**

The sphere in which people live and work.

**principles of war**

Broad precepts distilled from experience which influences the conduct of armed conflict and which should inform all strategic and operational decisions. There is some variation between the principles accepted by different nations. (JWP 0-01)

**readiness**

Preparedness to respond to government direction.

Note: It encompasses the resources needed to maintain equipment, conduct training, and prepare units for operations. (DTB Record 34053)

**reconnaissance (RECON)**

A mission undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy, or to secure data concerning the meteorological, hydrographic, or geographic characteristics of a particular area. (DTB Record 1202)



**rules of engagement (ROE)**

Directives issued by competent military authority which specify the circumstances and limitations under which forces will initiate and/or continue combat engagement with other forces encountered. (DTB Record 5285)

**search and rescue (SAR)**

The use of aircraft, surface craft submarines, specialized rescue teams, and equipment to search for and rescue personnel in distress on land or at sea. (DTB Record 1290)

**security (secur)**

1. The condition achieved when designated information, materiel, personnel, activities and installations are protected against espionage, sabotage, subversion and terrorism, as well as against loss or unauthorized disclosure. 2. The measures necessary to achieve protection against espionage, sabotage, subversion and terrorism, as well as against loss or unauthorized disclosure. (DTB Record 13836)

**sortie**

In air operations, an operational flight by one aircraft. (DTB Record 5386)

**spectrum of conflict**

The full range of relationships between states or groups, reflecting the frequency and intensity of violence. (DTB Record 35238)

**surveillance (surv)**

The systematic observation of aerospace, surface, or subsurface areas, places, persons, or things, by visual, aural, electronic, photographic, or other means. (DTB Record 1418)

**sustainment**

The ability of a nation or a force to maintain effective military power to achieve desired effects. (DTB Record 34949)

**task**

An activity which contributes to the achievement of a mission. (DTB Record 20312)

**task force (TF)**

1. A temporary grouping of units, under one commander, formed for the purpose of carrying out a specific operation or mission. 2. A semi-permanent organization of units, under one commander, formed for the purpose of carrying out a continuing specific task. (DTB Record 1457)

**transformation (tfmn)**

A continuous and proactive process of developing and integrating innovative concepts, doctrines, and capabilities in order to improve the effectiveness and interoperability of military forces. (DTB Record 28097)

**war**

The most extreme manifestation of armed conflict, characterized by intensive, extensive, and sustained combat, usually between states. (JWP 0-01)

**weapon system**

A combination of one or more weapons with all related equipment, materials, services, personnel and means of delivery and deployment (if applicable) required for self-sufficiency. (DTB Record 5631)

**whole-of-government approach (WoG approach)**

An integrated approach to a situation that incorporates diplomatic, military, and economic instruments of national power as required. (DTB Record 35242)

## LIST OF ABBREVIATIONS

<b>AAR</b>	air-to-air refuelling
<b>ADA</b>	Aerospace Doctrine Authority
<b>ADC</b>	Aerospace Doctrine Committee
<b>AFDT Div</b>	Air Force Doctrine and Training Division
<b>AI</b>	area of interest
<b>AO</b>	area of operations
<b>AOR</b>	area of responsibility
<b>ATO</b>	air tasking order
<b>C2</b>	command and control
<b>CAF</b>	Canadian Air Force
<b>CAP</b>	combat air patrol
<b>CAS</b>	Chief of the Air Staff
<b>CATGME</b>	Canadian Air Task Group Middle East
<b>CF</b>	Canadian Forces
<b>CEAWC</b>	Canadian Forces Aerospace Warfare Centre
<b>Comd 1 Cdn Air Div</b>	Commander 1 Canadian Air Division
<b>Comd 2 Cdn Air Div</b>	Commander 2 Canadian Air Division
<b>Comd AIRCOM</b>	Commander of Air Command
<b>CR</b>	combat recovery
<b>CSAR</b>	combat search and rescue
<b>DND</b>	Department of National Defence
<b>IADS</b>	integrated air defence system

<b>info ops</b>	information operations
<b>JATC</b>	Joint Air Training Centre
<b>JFACC</b>	joint forces air component command
<b>JFC</b>	joint force commander
<b>NAR</b>	non-conventional assisted recovery
<b>NATO</b>	North Atlantic Treaty Organization
<b>NDHQ</b>	National Defence Headquarters
<b>NORAD</b>	North American Air Defence Command
<b>OPCOM</b>	operational command
<b>OPCON</b>	operational control
<b>PR</b>	personnel recovery
<b>RAF</b>	Royal Air Force
<b>RCAF</b>	Royal Canadian Air Force
<b>SAR</b>	search and rescue
<b>TACOM</b>	tactical command
<b>TACON</b>	tactical control
<b>TAG</b>	Tactical Air Group
<b>TTP</b>	tactics, techniques and procedures
<b>UAS</b>	unmanned aerial system
<b>UN</b>	United Nations
<b>US</b>	United States
<b>USSR</b>	Union of Soviet Socialist Republics
<b>WoG</b>	whole-of-government