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Canada's Air Force Kinetic Capability for the 21st Century: What Is Needed?

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ABSTRACT

The *Canada First Defence Strategy* (*CFDS*) has outlined the future roles that the Canadian Forces may be called upon to deliver. In general terms, the Canadian Forces need to be capable of defending Canada and Canadian interests abroad in the pursuit of Canadian Government policies. In the *CFDS*, it has been indicated the intent to replace CF-188s, the only aircraft currently in the Canadian Air Force's inventory capable of land attack, with modern fighter aircraft. This signals that the Government of Canada understands the role that the Canadian Air Force can play in the support of deployed operations that require kinetic air power.

The intent of this paper is to step through the development of modern counterland theory and its application for the Canadian Air Force of the 21st Century. To accomplish this, the integration of kinetic air power to support ground operations will be examined from the perspective of the formulation of modern doctrine and how this doctrine is evolving with tangible trends to reflect the present use of air power in deployed operations. For the Canadian Air Force, there exists a unique opportunity to capitalize on the evolution of kinetic air support to ground operations through the procurement of new aircraft to provide kinetic effects. The kinetic capability of the Canadian Air Force needs to be examined with a view of deploying a balanced force of fixed-wing, rotary-wing and unmanned vehicles capable of delivering accurate firepower in both preplanned and reactive counterland missions. This force structure will provide the greatest impact to joint fires from the Canadian Air Force.

LIST OF ABBREVIATIONS

10 TAG – 10 Tactical Air Group

AI – Air Interdiction

ARS – Area Reference System

BCL - Battlefield Coordination Line

CAOC – Combined Air Operations Center

CAS - Close Air Support

CCA – Close Combat Attack

CFDS – Canada First Defence Strategy

CLP – Combat Logistics Patrol

COIN – Counter Insurgency

DCA- Defensive Counter Air

FAC- Forward Air Controller

FARP – Forward Arming and Refueling Point

FLIR – Forward Looking Infrared

FLOT- Forward Line of Troops

FOB – Forward Operating Base

FSCL – Fire Support Coordination Line

GARS – Global Area Reference System

GPS – Global Positioning Satellite System

GWOT – Global War on Terror

IADS – Integrated Air Defence System

IDF – Israeli Defence Force

IED – Improvised Explosive Device

IMP – Incremental Modernization Project

ISR – Intelligence Surveillance and Reconnaisance

JDAM – Joint Direct Attack Munition

JFC – Joint Force Commander

JFLCC – Joint Force Land Component Commander

JTAC – Joint Terminal Attack Controller

LFDTS – Land Force Doctrine and Training Systems

LGB – Laser Guided Bomb

NATO – North Atlantic Treaty Organization

NORAD – North American Aerospace Defence Command

OIF – Operation Iraqi Freedom

OEF – Operation Enduring Freedom

RCAF – Royal Canadian Air Force

ROVER - Remotely Operated Video Enhanced Receiver

RPG – Rocket Propelled Grenade

SAC – Strategic Air Command

SAM – Surface-to-Air Missile

TAC – Tactical Air Command

TACP – Tactical Air Control Party

TPP- Tactics, Training and Procedures

TRADOC – Training and Doctrine Command

TST – Time Sensitive Targeting

UAV – Unmanned Aerial Vehicle

UCAV – Unmanned Combat Air Vehicle

UN- United Nations

USAF – United States Air Force

USMC – United States Marine Corps

USN – United States Navy

INTRODUCTION

With the publication of the *Canada First Defence Strategy*, the Government of Canada has indicated its intent for the Canadian Forces to play a crucial role in the defence of Canadian interests at home and abroad. This strategy outlines six mission types that the Canadian Forces will be able to execute whether in North America or abroad. These missions are:

i. Conduct daily domestic and continental operations, including in the Arctic and through North American Aerospace Defence Command (NORAD);
ii. Support a major international event in Canada;
iii. Respond to a major terrorist attack;
iv. Support civilian authorities during a crisis in Canada such as a natural disaster;
v. Lead and/or conduct a major international operation for an extended period; and
vi. Deploy forces in response to crises elsewhere in the world for shorter periods.[1]

The success of the Canadian Forces to succeed in the fulfillment of these missions hinges on the ability of the Army, Navy and Air Force to complement each other's capabilities to maximize the efficacy of the contribution of the Canadian Forces to the achievement of Canadian policy objectives.

Canada's Air Force has a crucial role to play to provide capabilities that can only be provided using the flexible power projection that defines air power. Canadian Aerospace Doctrine defines the Canadian Air Force as a "…vital national security

[1] "Canada First Defence Strategy," http://www.forces.gc.ca/site/focus/first-premier/missions-eng.asp accessed 14 Jan 2010.

institution, an instrument of national policy and an element of national power."[2] The effects that the Canadian Air Force can provide range from firepower on a battlefield to surveillance of Canada's coastal waters to transport of resources, both people and equipment, for domestic and international operations. For non-kinetic effects, the Air Force needs to be equipped and trained to enable supported units to arrive on time with the correct force composition to carry out their missions. For kinetic effects, the Air Force can play an active role with proper doctrine and equipment to attain mission success.[3]

The willingness of the Canadian Government to the use the Canadian Forces to defend Canadian interests abroad in the 21st Century was signaled with the deployment of the Canadian Navy on Operation Apollo to the north Arabian Sea in October 2001. The North Atlantic Treaty Organization's (NATO) invocation of Article 5 of the Washington Treaty in response to the terrorist attacks on the United States in September 2001 provided the alliance framework for this deployment.[4] Canada's contribution to what became known as the Global War on Terror (GWOT) followed with the deployment of a Battle Group to Kandahar, Afghanistan built around the 3rd Battalion, Princess Patricia's

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[2] Department of National Defence, B-GA-400-000/FP-000 *Canadian Forces Aerospace Doctrine* (Ottawa, ON: Department of National Defence, 2007), ii.

[3] Kinetic effects are those delivered from explosive weapons. For example, the kinetic effect of a bomb exploding may be the destruction of a building. Non-kinetic effects are those effects that can be accomplished without the use of a weapon. For example, a non-kinetic effect to clear a building may be done with loudspeakers warning of an attack.

[4] Press release, "Members of Parliament from NATO countries Declare Solidarity with United States, Support for Article 5 Collective-Defence Declaration," http://www.nato-pa.int/archivedpub/press/p010914a.asp accessed 27 March 2010.

Canada Light Infantry.[5] The deployment of forces in the GWOT has continued throughout the first decade of the 21st Century with the heavy engagement of the Canadian Forces in operations throughout Southwest Asia by units from all three services of the Canadian Forces. What has been missing from these operations has been the delivery of kinetic effects from the Canadian Air Force to support operations by Canadians fighting the insurgency in Afghanistan. Canadian kinetic air power was absent from Afghanistan until the deployment of CH-146 Griffons to Kandahar in 2008 armed only with machine guns mounted as door guns, which limit the effects that these aircraft can deliver.[6]

The question that begs to be asked is what other kinetic effects can the Canadian Air Force deliver in the 21st Century in the pursuit of the policy objectives of the Canada First Defence Strategy? The Canadian Air Force is equipped with the CF-188 Hornet that has completed avionics and equipment upgrades that make it a versatile, fourth generation fighter aircraft that is able to project offensive and defensive air power across wide distances quickly. The CP-140 Aurora and CH-148 Cyclone are weapons platforms that will enable the Canadian Air Force to assist the Canadian Navy execute maritime missions around the world. The CU-170 Heron is an indication of the intent of the Canadian Air Force to expand the Unmanned Aerial Vehicle (UAV) capabilities with a potential to include weapon delivery. The provision of additional firepower for CH-146s

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[5] "The Canadian Forces' Contribution to the International Campaign Against Terrorism," http://www.comfec-cefcom.forces.gc.ca/pa-ap/nr-sp/doc-eng.asp?id=490 accessed 27 March 2010.

[6] Tom Kupecz, "Escort for Canada's *Chinook* Helicopter." *Canadian Military Journal* 8, no 3 (Autumn 2007): 94.

deployed to Afghanistan highlights the requirement to provide armed escort helicopters for the CH-147 Chinooks that are operating in the Afghanistan theatre of operations.[7]

The Canadian Air Force needs to determine the force structure it requires for the 21st Century in order to best provide kinetic effects on the present and future battle spaces of the 21st Century. In particular, the Air Force needs to be prepared to deliver kinetic effects to support land operations in order to maximize the contribution the Air Force makes to the defence of Canadian interests abroad. This paper will show the relevance of aerial firepower for the 21st Century for land operations. To accomplish this, this paper will first discuss the changing nature of conflict in the 21st Century and what this means for the Canadian Air Force. The next topic of discussion will be the evolution of the kinetic capability of the Canadian Air Force in a modern context using the history of operations from the last two decades of the 20th Century into the 21st Century. The penultimate topic will be to discuss the current trends in Western militaries for the development and use of aircraft, whether manned or not, as Air Forces look to the future. The final chapter will follow the framework of the previous chapters to provide a perspective for the Canadian Air Force for the 21st Century and how it will be able to best provide a contribution to kinetic effects to defend Canadian interests at home and abroad.

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[7] *Ibid.*, 93.

CHAPTER 1 – Development of Air-Ground Doctrine

The end of the Cold War brought a period of uncertainty for planners in Western militaries. The overwhelming success of the Coalition Forces in Operation Desert Storm was viewed as a vindication of the development of the US fighting doctrine of AirLand Battle as a means to fight the Warsaw Pact in Central Europe. This doctrine, a development of the US Army's previous doctrine of Active Defense, was a synchronization of the combined effects of land and air firepower in order to defeat an adversary that was not only in contact with friendly forces but also on the follow-on forces that had not yet entered the fight. AirLand Battle depended on the ability of forces from NATO to engage and defeat a numerically superior enemy through the combination of speed and agility of joint forces enabled by technology to strike at key points along and behind the front line.[8]

In the context of the Canadian Air Force, the evolution of the fighting doctrine of the US Air Force (USAF) and Army is important because of the influence that these forces have on the fighting doctrine of NATO. The size of the US military gives it a large influence over NATO doctrine; not through malicious intent but through the importance of US forces and their firepower to the NATO alliance. The Canadian Air Force has and will continue to evolve based on its doctrine. For delivering land kinetic effects specifically, the AirLand Battle and the United States Air Force air-ground

[8] John Andreas Olsen, *John Warden and the Renaissance of American Air Power*, (Washington, DC: Potomac Books, 2007), 103.

doctrine has remained a key influence in the provision of counterland missions in the Canadian Air Force.[9]

The US Army emerged from the Vietnam War as a battered force that institutionally required self-examination to draw lessons on how it would fight. The US Army also examined the 1973 Yom Kippur War to glean lessons for how to fight while outnumbered.[10] The paradigm that the US military had been using, large conventional forces manned by conscripts from a draft, was modelled on the Second World War industrial way of fighting war. The end of the draft at the conclusion of the Vietnam War ended the belief that follow-on forces, trained after the start of war, could contribute to the success of the US military to win wars.[11] The imperative for forces in place, able to carry the burden of fighting, became evident as the US Army moved on from Vietnam and looked at the role that it would have in any NATO confrontation with the Warsaw Pact in Central Europe.

Exiting Vietnam, the foreign and defence policies of the US "…implied that the US national defense posture should reemphasize the primacy of the defense of Western Europe over US involvement in other parts of the globe."[12] The US Army's Training and Doctrine Command (TRADOC) therefore needed to development a fighting doctrine that would allow the US Army to lead the way in the development of tactics to enable NATO

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[9] Counterland missions are defined as air and space operations against enemy land force capabilities to create effects that achieve joint force commander objectives. US Air Force, Air Force Doctrine Document 2-1.3 *Counterland Operations* (Washington, DC: US Air Force, 2006) viii.

[10] Saul Bronfeld, "Fighting Outnumbered: The Impact of the Yom Kippur War on the U.S. Army Part 1," *The Journal of Military History* 71, no 2 (Apr 2007): 469.

[11] *Ibid.,* 473.

[12] *Ibid.,* 469.

to push back a Soviet assault across West Germany. TRADOC examined the Yom Kippur war of 1973 to place the developing tactics of Active Defense, and then AirLand Battle, in the context of an outnumbered but more technologically advanced NATO conventional military dominating on the battlefield.[13]

As the US Army was developing its fighting doctrine of AirLand Battle, the USAF was going through the machinations of its own doctrinal development. When the USAF became a separate service in 1947, the strategic bomber in the nuclear role reigned supreme. Strategic Air Command (SAC) had the most influence on the development of tactics and equipment of the USAF throughout the 1950s and 1960s.[14] It was not until the Vietnam War that tactical air power became more prominent and started to edge into the limelight with SAC. This tactical air power, in the form of fighter aircraft of varying sizes and sophistication, bore the brunt of the fight in the air with fighters from the USAF, United States Navy (USN) and United States Marine Corps (USMC) carrying the fight to the enemy or flying support missions for friendly troops in contact with the enemy.[15]

As a result of the experiences in Vietnam, Tactical Air Command (TAC) started to develop doctrine in concert with TRADOC that contributed to the air piece of the integration of kinetic power in a fight along the doctrinal lines of AirLand Battle.[16] The development of tactics to allow fighters to either operate close to the forward line of

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[13] *Ibid*., 473-474.

[14] Olsen, *John Warden and the Renaissance of American Air Power*, 102-103.

[15] Wayne Thompson, "Operations Over North Vietnam," *A History of Air Warfare* ed. John Andreas Olsen, (Washington, DC: Potomac Books, 2010), 119.

[16] Olsen, *John Warden and the Renaissance of American Air Power*, 104-105.

troops (FLOT) or in-depth behind the forward echelons of enemy troops allowed TAC to drive the development and procurement of new fighter aircraft such as F-16 Fighting Falcon for the USAF and F-18 Hornet for the USN and USMC. With the increase in influence of TAC into any future fight, especially against the Warsaw Pact in Central Europe, what has become know as the "Fighter Mafia" grew in power and influence in the USAF.[17]

Not all within the "Fighter Mafia" were content with the status that TAC had adopted of closely aligning the fighting doctrine of fighters to being closely tied to supporting the Army as per AirLand Battle. Some within the USAF started to argue that air power could make more of a contribution to fighting in a high-intensity conventional conflict than direct support of the ground forces. The chief proponent of the idea of using air power as a deciding factor in a conventional fight was John Warden, a USAF colonel and fighter pilot. His book, *The Air Campaign* written in 1989, laid the framework for "…design[ing] a coherent and unified air campaign. By doing so he hoped to provoke and reopen the debate on the true potential of conventional air power."[18] Warden felt that the AirLand Battle doctrine would relegate the USAF to a supporting tactical role to the US Army without allowing air planners to identify and attack operational targets that would better serve the goals of an operational air campaign.[19]

On the surface, Warden's argument for the separation of an air campaign from ground operations would appear to dismiss the role of air support for ground operations.

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[17] John Jogerst, "Air Power Trends 2010: The Future is Closer Than You Think," *Air & Space Power Journal* (Summer 2009), 101-102.

[18] Olsen, *John Warden and the Renaissance of American Air Power*, 64.

[19] *Ibid.*, 65.

This is not the case, and Warden points to the flexibility that CAS can provide a ground commander. In Warden's view, CAS should be used as an operational reserve to either blunt an enemy attack or to break through enemy lines:

> Like interdiction – and the operational reserve – close air support seems to work best when the ground situation in dynamic. Close air support has the ability to make holes that can be exploited offensively, and it has the ability to do serious damage to enemy offensives.[20]

Warden's promotion of the operational art of using air power in a campaign came to fruition when Saddam Hussein invaded Kuwait in 1990. The air campaign that Warden helped to design for Operation Desert Storm in January 1991 epitomized the effectiveness of Western air power in a campaign designed to gain air superiority over an adversary and then methodically attack identified centres of gravity in order to decrease the fighting effectiveness of an adversary.[21]

The overwhelming success of the Allied Coalition fighting the large conventional forces of the Iraqi military in 1991 was an indication of the maturity of the fighting doctrines of Western armies and air forces. The famous "left hook" of the ground forces through eastern Iraq rather than a frontal assault through Kuwait has been lauded as the ultimate example of the fighting prowess of modern Western militaries. The effectiveness of the air campaign in attacking strategic leadership, infrastructure and

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[20] *Ibid*., 96.

[21] John Andreas Olsen, "Operation Desert Storm, 1991," *A History of Air Warfare* ed. John Andreas Olsen, (Washington, DC: Potomac Books, 2010), 182.

fielded force targets showed the lethality of fighter aircraft equipped with modern air-to-air and air-to-ground weapons.[22]

Changing Face of Battle

This conventional fighting might did not stagnate in 1991. NATO's Operation Allied Force air campaign against Serbia in 1999 reinforced the image of the lethality of air power. The invasion of Afghanistan in 2001 and Iraq in 2003 did little to dispel the conclusion that the conventional fighting power of the US, and by extension Western militaries as a whole, could not be matched by any other state competitors. The experience of the Taliban and then the Iraqi regime showed potential adversaries that engaging in conventional fighting would not be an effective way to either resist or defeat Western militaries.[23]

This conclusion, reached by state and non-state actors alike, provides an indication on the future of fighting in the 21st Century. The likelihood of major state-on-state conventional conflict is not great as the 21st Century progresses.[24] More likely conflict scenarios involve low-intensity conflicts that blend differing means of fighting to attain an objective. An excellent description of how wars will be fought in the 21st Century is "Hybrid War". The proponents of this school

> …believed that irregular challenges represented one end of a single continuum with more dramatic and costly catastrophic challenges occupying the opposite extreme. [B]oth the combination of mounting irregular and catastrophic challenges…indicate that active challenges would often blend into complex

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[22] *Ibid.*, 196-198.

[23] Natan Freier, Strategic Competition and Resistance in the 21st Century: Irregular, Catastrophic, Traditional and Hybrid Challenges in Context, (Carlisle: Strategic Studies Institute, 2007), 15.

[24] Lieutenant- Colonel Bruce Floersheim, "Forging the Future of American Security with a Total Force Strategy," *Orbis* 53, no. 3 (Summer 2009): 474.

> hybrids. …Clear throughout, however, was the idea that all consequential actors – state and nonstate – were moving away from traditional military rivalry as the principal forum for competition with the United States.[25]

An excellent example of this is the 2006 conflict in southern Lebanon between the Israeli Defence Force (IDF) and Hezbollah, a non-state actor whose indirect attacks on Israel led Israel to attack its forces. Israel was not successful in destroying Hezbollah because of the challenges presented by its opponent. Hezbollah did engage in conventional, force-on-force fighting but it also fought the IDF using guerrilla tactics. Direct conventional tactics and indirect guerrilla tactics of Hezbollah presented the IDF with the hybrid threat that will be the face of battle for the 21st Century.[26]

The fighting method chosen by Hezbollah in its confrontation with the IDF is not unique to non-state actors. In the book *Unrestricted Warfare*, the two authors, Qiao Liang and Wang Xiangsui, both colonels in the People's Liberation Army of China, acknowledge that a dominant conventional adversary cannot be defeated using direct attacks. Their book reveals how nations like China, faced with an American military so technically advanced, can overcome this advantage and defeat the enemy.[27] Qiao and Wang provide suggestions for how warfare will be fought in the 21st Century in suggesting total war. Their theory is that total war, combining military attacks with those on economic, social and political targets, is an excellent example of how a lesser military force can leverage off the vulnerabilities of a larger military force to confront an

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[25] Natan Freier, *Strategic Competition and Resistance in the 21st Century: Irregular, Catastrophic, Traditional and Hybrid Challenges in Context*, 6.

[26] Ralph Peters, "Lessons from Lebanon: The New Model Terrorist Army," *Armed Forces Journal International* 144, no. 3 (October 2006), 39.

[27] Qiao Liang and Wang Xiangsui, *Unrestricted Warfare* (Panama City, Panama: Pan American Publishing Company, 2002), ix.

adversary on more equal terms. This theoretical blueprint outlined by Qiao and Wang serves as a guidepost on how to provide "…meaningful resistance to [a] dominant military power."[28]

For Western military forces to confront the challenges of hybrid warfare, they will need to adapt their ground force structure to include flexible conventional forces that are highly mobile and adaptable to different fighting situations. They will need to be able to close with and engage a hybrid threat "…whose cover and concealment make them impossible to destroy at standoff ranges."[29] These same forces will need to be able to contribute to the security in a Counter Insurgency (COIN) campaign that does not require as robust a force structure. Victory in COIN for a military rests with providing security to the development efforts to render insurgents irrelevant and without support.[30] While not definitive, the solutions to the force structure demands for Western militaries are easier to define for ground forces than it is for air forces. It is widely acknowledged that the fighting forces of future will be smaller mobile forces that will operate more independently from each other than in previous constructs. These forces, often not in contact with flanking units, will require the support of air power in order to accomplish their missions. The role of air power in a hybrid conflict will often be the "…indirect application of airpower [sic] – that is, the use of aviation resources for reconnaissance,

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[28] Natan Freier, *Strategic Competition and Resistance in the 21st Century: Irregular, Catastrophic, Traditional and Hybrid Challenges in Context*, 37.

[29] Biddle and Friedman, *The 2006 Lebanon Campaign and the Future of Warfare: Implications for Army and Defense Policy*, 80-81.

[30] Kenneth C. Coons and Glenn M. Harned, "Irregular Warfare is Warfare," *Joint Force Quarterly* 52 (1st Quarter 2009): 99.

transportation, psychological operations, and communications – that proves most useful."[31] To this must be added the movement of armies

> …to become more strategically deployable and agile on the battlefield, [thereby] reducing the weight of ground-based fires available to maneuver units. Although not yet fully detailed, the number of independent artillery brigades will shrink. … Moreover, operations are expected to center increasingly on independent brigades, which will operate without or with less corps fire support. These factors, combined with a newfound [confidence] in the accuracy and responsiveness of air-delivered fires, will result in increased requests for CAS and air interdiction.[32]

The renewed emphasis on joint operations is clear because of the complimentary nature that services have with each other. It is this fluid nature of conflict that will require joint forces that can operate together to best meet the objectives of a campaign.[33]

The future for air power in the 21st Century is not to act as the sole decisive force because "…aerospace forces as a single force element are limited in solving the totality of …military problems."[34] Air power will retain the ability to project power through speed, range, precision and versatility across the spectrum of conflict and operations throughout the world.[35] The central tenants for how air power will contribute to the militaries of the Western nations are through three concepts described by USAF General T. Michael Moseley. These tenants are:

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[31] James Corum and Wray Johnson, *Airpower in Small Wars: Fighting Insurgents and Terrorists*," (Lawrence, KS: University Press of Kansas, 2003), 8.

[32] Bruce Pirnie *et al*, *Beyond Close Air Support: Forging a New Air-Ground Partnership* (Santa Monica, CA: RAND, 2005), 167-168.

[33] Joint Chiefs of Staff, *Joint Publication 3-0 Joint Operations*, (Washington, DC: Joint Chiefs of Staff, 2008), xii-xiii.

[34] Gene Myers, "Projecting Power," *Armed Forces Journal* 146, no. 1 (July/August 2009): 20.

[35] *Ibid.*, 20.

vii. Global vigilance – persistent world-wide capability to keep an unblinking eye on any entity;
viii. Global reach – ability to move, supply or position assets with unrivalled velocity and precision; and
ix. Global power – ability to hold at risk, or strike, any target, anywhere in the world and project decisive, precise effects.[36]

The ability of Western air forces to provide forces able to deliver on these tenants is central to the relevancy of air power in the 21st Century. This is relevant to the Canadian Air Force in the context of kinetic land support because of the timing of the renewed interest in air power to support ground operations with the tenants described above. The Canadian Air Force needs to closely examine how to structure itself for future conflicts because, "…as Canada makes plans to replace its F-18 [sic] fleet, it is looking at a mix of manned and unmanned platforms. … Canada is also looking at its future UAV needs, and this could include – indeed, is likely to include – a platform with a ground strike capability."[37]

Global vigilance can be provided by either air breathing or space based platforms. The former can be armed with weapons to aid in giving flexibility to both ground and air commanders alike. Systems such as the MQ-9 Reaper is an excellent example of an aircraft that can provide persistent intelligence, surveillance and reconnaissance (ISR) support to an operation that also provides a kinetic capability with bombs or missiles. Global reach alludes to the "…range and speed essential to 21st Century military

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[36] T. Michael Moseley, "America's Air Force: The Nation's Guardian," *Joint Force Quarterly* 49 (2nd Quarter 2008): 11.

[37] Elinor Sloan, "The Role of Aerospace Power 2018 and Beyond," in *The International System, Canada, Armed Forces and Beyond* Silver Dart Canadian Aerospace Studies, vol. V, ed. James G. Fergusson (Winnipeg, MB: University of Manitoba, Centre for Defence and Security Studies, 2009), 148.

operations."[38] This will allow high-demand, low density assets such as fighter aircraft to range across a whole area of operations without being tied to one geographic area. The final tenant, global power, is central to the understanding of the future of air power. This speaks to the capability of air forces to deliver weapons against air and ground targets alike. The ability to project power will be hinged on the ability to either blunt enemy attacks or break through enemy lines as envisioned by Warden.[39] Gene Myers has summed up the future of air power in the 21st Century thus:

> Since history clearly teaches us that we really don't know where and to what degree we will be involved next, flexibility and versatility are the keys to military readiness – the most important and validated of aerospace power characteristics.[40]

It is therefore interesting to examine the future of air power in the context of the Canadian Air Force. This is especially timely with the announced reduction that Canada will play in the fight against the counterinsurgency in Afghanistan: a mission that has been a defining moment in the history of the Canadian Forces. The lack of air force kinetic power in that theatre until 2008 should give pause to the commanders of the Canadian Air Force to reflect about how, if at all, Canadian aircraft should be equipped with offensive weapons.

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[38] Gene Myers, "Projecting Power," 21.

[39] John Warden, *The Air Campaign*, 90.

[40] Gene Myers, "Projecting Power," 40.

Influence on the Canadian Air Force

Canadian foreign and defence policies will continue to be driven by its relationship with the United States. However, Ottawa will not be beholden to Washington in the formulation of policies that will decide the future employment of the Canadian Forces. This is made very clear in the *Canada First Defence Strategy* (*CFDS*) as described in the introduction.[41] Also, as Alexander Moens has noted:

> [t]he growth in NATO's role and mandate will be an important part of Canadian foreign policy as it allows Canada to combine working interests inside an alliance and within Canadian-American interests. The investments in military equipment started in 2006 to support Canada's robust role in Afghanistan give it a strong foundation to be in the vanguard of alliance operations.[42]

As in other countries around the world, Canada is engaged in debate about how defence and foreign policies will be set in the 21st Century. It is acknowledged that Canada will not take unilateral military action but will operate in cooperation with other countries to meet policy goals and objectives. These coalitions may not necessarily be restricted to NATO or the UN, but will be established depending on the geopolitical situation at the time. The Canadian Forces needs to remain capable of conducting a range of missions to reflect the reality of the present and future missions of the Canadian Forces. Therefore, because the future is uncertain, the Canadian military needs to retain the capacity for the

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[41] "Canada First Defence Strategy," http://www.forces.gc.ca/site/focus/first-premier/missions-eng.asp accessed 14 Jan 2010.

[42] Alexander Moens, "Canadian Domestic and Foreign Policy Determinants in 2018," *The International System, Canada, Armed Forces and Aerospace Power, 2018 and Beyond* vol. V, ed. James G. Fergusson (Winnipeg, MB: University of Manitoba, Centre for Defence and Security Studies, 2009), 123.

full spectrum of potential operations in which the Canadian military could conceivably engage.[43]

Returning to the *CFDS*, the Canadian Air Force can play a role in providing firepower for all of the envisioned combat roles outlined in the document. The fighter force will continue to play a pivotal role in Canada's contribution to North America Aerospace Defence Command (NORAD). Armed aircraft ensuring the sovereignty of Canada, whether in the Arctic or further south in Canada, will continue for the foreseeable future. Kinetic air power will also provide unique capabilities in the support of international operations abroad for either extended or short periods of time. This kinetic support is not limited to fighter aircraft but may also include armed UAVs and armed helicopters that are able to provide firepower in support of a mission.

The ability of the Canadian Air Force to provide relevant kinetic air power will depend on decisions that take place over the next decade as aircraft such as the Griffon and Hornet come up for replacement. The replacements for these airframes will be complemented with other aircraft that will allow the Canadian Air Force to provide flexible, wide-ranging and precise firepower to an operation. The chaotic nature of conflict in the 21st Century will require Canada to stay engaged internationally for the protection of its sovereignty and the promotion of its interests abroad. A kinetic capability on the part of the Canadian Air Force will therefore be paramount for the effective conduct of operations by the CF when engaged in operations such as those recently experienced in Afghanistan.

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[43] Department of National Defence, *Rapier or Broadsword*, 31.

CHAPTER 2 – The Modern Fighting History of the Canadian Air Force

It took 46 years after the end of the Second World War for the Canadian Air Force to take to the skies in battle over the Persian Gulf during Operation Desert Storm.[44] It would take another eight years before Canadian fighters once again conducted offensive air strikes as part of Operation Allied Force, the 1999 NATO air campaign against Serbia in retaliation to Serb atrocities in the province of Kosovo.[45] The Canadian Air Force has not sent aircraft offensively into battle since then, despite the heavy engagement of the Canadian Army in Afghanistan and the Canadian Navy in the Persian and Arabian Gulfs in the Global War on Terror. Canadian aircraft, such as the CC-130 Hercules, have operated in theatres where they came under attack, but no CF-188s, the only aircraft in the Canadian Air Force inventory capable of offensive kinetic operations against land targets, have been committed to action since 1999. The answer to why no Canadian fighter aircraft have been engaged in operations alongside the Canadian Army is not easily answered but can be placed in context by examining the development of kinetic capabilities, for either air-to-air or air-to-ground missions, for the Canadian Air Force since 1945.

When the Korean War started in 1950, Canada elected to participate in the collective United Nations effort to fight in South Korea and force the withdrawal of

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[44] Canadian fighter pilots did fly USAF Sabres in Korea but they did not fight as part of a formed Canadian unit in conflict. Brereton Greenhaus and Hugh Halliday, *Canada's Air Forces 1914-1999*, (Montreal, QC: Art Global, 1999), 130.

[45]Michael W. Manulak, "Canada and the Kosovo Crisis: A 'Golden Moment' in Canadian Foreign Policy?" *International Journal* (Spring 09): 566-567.

North Korean forces from South Korea.[46] The Canadian contribution to the war was limited from the perspective of aircraft: Canadian ground and naval forces were heavily engaged throughout the conflict but participation from the Royal Canadian Air Force (RCAF) was limited to 426 Transport Squadron.[47] At this time, the RCAF was transitioning its fighter aircraft from propeller aircraft such as the P-51 Mustang to jet aircraft such as the DH-100 Vampire.[48] However, the RCAF was not able to contribute to the air war because of the limitations of this aircraft.

In the Korean War, the air war was fought by aircraft of emerging technology coupled with proven airframes from the Second World War. The RCAF no longer had the robust bomber fleet of 6 Bomber Group lore, as those aircraft had become obsolete with the advent of jet-powered fighter aircraft. The USAF's B-29 Superfortress was used extensively in the conflict for air-ground attack but these aircraft were countered by Soviet-built MiG-15s. It was recognized that the RCAF's DH-100s were no match for the air threat and subsequently no RCAF fighters were deployed to Korea. The RCAF was transitioning to the F-86 Sabre, a capable fighter able to match or outperform the MiG-15, but the focus of RCAF Sabres was not Korea but Europe or North America. "Canadian Sabres were directed to home defence or to meet NATO commitments…" at a

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[46] Elizabeth Ridell-Dixon, "Canada at the United Nations 1945-1989", *International Journal* (Winter 2006/2007): 148.

[47] Department of National Defence, *On Windswept Heights,* (Ottawa, ON: Department of National Defence, 2009), 36.

[48] Greenhous and Halliday, *Canada's Air Force 1914-1999,* 130.

time that the Korean War had stabilized and no escalation in participation in Korea was required of the RCAF.[49]

It was this focus on defence of North America and meeting NATO commitments that were the defining tenants of the RCAF's offensive and defensive capability, a trend that continues to the present day. Acquisition of fighter aircraft after the introduction of the F-86 Sabre was focused on the requirements for NORAD and NATO missions. For the former, the fighters required were interceptors capable of all-weather intercept of Soviet transcontinental bomber aircraft. This requirement was met by the acquisition of aircraft such as the CF-100 Canuck and the CF-101 Voodoo, which were the cornerstone aircraft of Canada's NORAD force during the Cold War.[50] Both the Canuck and the Voodoo lacked an air-to-ground capability and therefore did not contribute to the provision of a ground support capability to the Canadian Army. The aircraft acquired to fulfill the requirements of NATO roles were also limited in scale of support that Canadian fighters could provide the Army.[51]

The first Canadian air-to-ground fighter for NATO missions was the CF-104 Starfighter. This aircraft was originally acquired as a high speed strike and reconnaissance fighter to equip RCAF squadrons in Central Europe. Designed by Kelly Johnson and his staff at Lockheed Martin's Skunk Works, the Starfighter was intended to be a high-altitude, supersonic interceptor but was used in Europe in attack roles. The strike role flown by the Starfighter, by definition, did not lend itself very well to close

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[49] *Ibid.*, 130.

[50] *Ibid.*, 150-151.

[51] John Gellner, "Canada in NATO and NORAD," *Air University Review* XVIII, no 3 (March-April 1967), 24-25.

cooperation with ground forces. The nuclear weapons that Starfighters would have delivered were targeted far beyond the front line; targets for Canadian pilots deep within East Germany and Czechoslovakia. When the Canadian government moved the Canadian Forces away from nuclear roles, the Starfighter's mission was changed to conventional attack but still focused on air interdiction rather than missions to directly support the Canadian Army. [52]

The RCAF had acquired fighters that were not suited to employment in support of land operations and, upon unification, the Canadian Air Force inherited these aircraft. Not necessarily by design but more by political manipulation, the next fighter that the Canadian Air Force acquired could be used for CAS. Paul Hellyer, the Minister of National Defence from 1963 to 1967, forced upon the Canadian Forces the CF-116 Freedom Fighter. The focus of the leadership of the Canadian Air Force was on retaining a multi-role capability and the consensus among the Air Force brass was that the McDonnell Douglas F-4C should be acquired to fill NATO and NORAD requirements. [53] However, Hellyer's championing of the CF-116 was not based on mission requirements but was rooted in politics and economics. The aircraft were to be built under license in Canada, thereby providing jobs, and were not as expensive to purchase because they were solely ground attack aircraft. In fact, when the CF-116 was introduced into service, the Canadian military had to find a role for the aircraft because it was deemed to be not suitable for use in Central Europe. The role that Canada assumed for reinforcement of

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[52] Anthony Stachiw and Andrew Tatersall, *Canadair CF104 Starfighter*, (St. Catherines, ON: Vanwell Publishing, 2007), 24.

[53] Ray Stouffer, "Cold War Air Power Choices for the RCAF: Paul Hellyer and the Selection of the CF-5 *Freedom Fighter*." *Canadian Military Journal* 7, no 3 (Autumn 2006), 63.

Norway in the event of conflict was a good fit because the assessment of Soviet air defence and fighter capability in that area of operations was deemed acceptable for employment of CF-116s.[54]

Therefore, the first serious foray of Canadian fighters into missions supporting ground operations came not by design on the part of the Air Force but more by default with the acquisition of the CF-116. The aircraft were operated by squadrons that were part of 10 Tactical Air Group (10 TAG) that were part of Mobile Force Command (MFC).[55] MFC, created after the unification of the Canadian Forces in 1964, was the command of the Canadian Army. While the CF-116 did suffer from range and payload limitations, the provision of support to ground operations marked a high point in joint capabilities between the Canadian Army and Canadian fighter aircraft. Fighter pilots were qualified as Forward Air Controllers (FACs), complimenting the other Air Force FACs who flew CH-136 Kiowa with other 10 TAG squadrons.[56] The inclusion of Air Force FACs, specifically fighter pilots, provided visibility to the Army of the contribution that coordinated air power could bring to land operations.

Fighter pilots maintaining positions and qualifications as FACs continued in the modern era when the CF-104, CF-101s and CF-116s were replaced with the CF-188 Hornet starting in 1982. The Hornet was envisioned as a multi-role fighter that would be able to conduct both air-to-air and air-to-ground missions for both NORAD and NATO missions. The Hornet has been successful in both roles and has received substantial

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[54] *Ibid.,* 69.

[55] Greenhous and Halliday, *Canada's Air Forces,* 142.

[56] *Ibid.,* 142.

avionics upgrades with the Incremental Modernization Project (IMP). IMP has provided the Canadian Air Force with a fighter that is on par with similar fighters in terms of communications, sensors and weapons.[57]

The Canadian Air Force has an extremely capable fighter aircraft in the CF-188 that is able to excel in both air and ground attack missions but these aircraft have not been deployed to Afghanistan in support of the Canadian Army in Kandahar province. Superficially the answer to the question of why this is the case is that having Hornets in theatre would be an escalation in the Canadian mission and is also cost prohibitive. While this does factor into why Hornets were not deployed to Kandahar airfield, the answer to the question lies more in the cultures of the Canadian Air Force and Army over the last twenty years since the end of the Cold War.

When Hornets took to the skies in Operations Desert Storm and Allied Force, the missions that were flown were seen as a validation of the air power theories of John Warden in the design of an air campaign using fighters to strike at critical nodes of an adversary's power. The missions that Canadian pilots flew in Kuwait and Iraq were Sweep and Escort air-to-air missions and also conducted air interdiction missions dropping unguided bombs on Iraqi positions after the start of the ground offensive.[58] When Hornets again took to the air in combat in Allied Force, the bulk of the missions flown were Air Interdiction (AI) or Defensive Counter Air (DCA) missions. The missions that were tasked as CAS in Kosovo were not doctrinally pure CAS because, due to the fact that no NATO ground forces were committed to conflict in Kosovo, these

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[57] Department of National Defence, "CF-18 Modernization: Acceptance of First Phase I Modernized Aircraft," BG-03.031, May 14, 2003.

[58] Greenhous and Halliday, *Canada's Air Forces*, 154-155.

missions were not flown to integrate offensive air strikes into the ground scheme of manoeuvre. The experiences gained from Desert Storm and Allied Force were taken as validation of the emphasis that was placed on the training that Canadian fighter pilots received in DCA and AI missions.[59]

Both before and after Operation Allied Force, the fighter force witnessed a decrease in the number of trained effective fighter pilots and technicians. The modernization of the airframe was also announced but it was decided, for both engineering and financial reasons, that only 80 Hornets would be upgraded and the remaining aircraft would be retired.[60] The next event that took place that changed the dynamic of training and employment of the fighter force were the terrorist attacks in the United States on 11 September 2001. These attacks led to an increase in the number of CF-188s on alert duties at the same time that the fleet was starting to undertake its modernization.[61] The increase of NORAD duties in 2001 and 2002 severely restricted the number of aircraft that were available for expeditionary operations. When the Canadian Army became heavily engaged in operations in Afghanistan in 2003, the Hornet fleet was poised to provide a contribution to the provision of air fires in support of Canadian operations but Hornets were not deployed. The NORAD tasking level had decreased which freed up airframes for deployment but Hornets were not deployed for

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[59] Department of National Defence, B-GA-432-000/FP-002 Aug 2002 *Fighter Pilot Training Directive* (Winnipeg, MB: Department of National Defence, 2002).

[60] The decision to update 80 aircraft was based on money available for the project and the fact the earliest lots of CF-188s received could not be upgraded under the ECP-583 programme because of physical airframe limitations, ie. different bulkheads.

[61] Joseph Jockel, *Canada in NORAD, 1957-2007: A History*, (Kingston, ON: McGill-Queen's University Press, Queen's Centre for International Relations and Defence Management Program, 2007), 167.

combat operations because of the culture that had developed within the fighter force with respect to CAS.

Prior to the deployment of Canadian units to Afghanistan, the Canadian Army and the fighter force had grown apart since the days of fighters belonging to 10 TAG. The stand-up of 1 Canadian Air Division and the dissolution of the Air Groups in 1997 was the first step in the disengagement of the fighter force from the Canadian Army. This disengagement had started with the retirement of the CF-116 from operational squadrons in 1988 and it accelerated throughout the 1990s. Canadian fighter pilots were deployed as FACs in support of Canadian units in Bosnia-Herzegovina but this marked the high water point of Canadian fighter pilot engagement with the Canadian Army. After these deployments the number of fighter pilots qualified as FACs steadily decreased. The end of the brigade level exercise Rendez-vous in 1997 also limited the large event training exercises for CF-188s with Army brigades. After Allied Force, the fighter force continued to concentrate on AI missions as its specialty for air-to-ground missions. Conversely, due to the disengagement of the fighter force from providing FACs, the awareness among Army officers of the firepower effects that fighters are able to provide a ground commander was not well understood.[62]

The unintended consequences of the these events led to the tragic events in September 2006 where a USAF A-10 mistakenly fired on Canadian troops, killing one

[62] During the author's time as a pilot on an operational fighter squadron, there were no large scale training events with the Canadian Army until the start of the Maple Guardian series of exercises in Wainwright, the planning of which started in 2005-2006.

soldier and wounding over 30 in a single strafing pass.[63] There were many individual events that led to this tragic event, from obscured visibility to fatigue, but one key contribution was the lack of a Tactical Air Control Party (TACP) with the Canadians at the brigade or battle group level. In Bosnia, there had been TACPs attached to the Canadian units that were populated by fighter pilots; these pilots were trained as FACs and their expertise on CAS from the perspective of the pilot was leveraged in order to maximize the CAS support to the ground commander. However, by 2006 the Canadian Forces was not following doctrine and TACPs had not been formed or deployed into the theatre of operations.[64] Unfortunately, it took this accident to bring this deficiency to light in the subsequent investigations.

The doctrinal role of a TACP is to advise ground commanders on the best use of aircraft, maintain command and control of air assets and as required provide terminal attack guidance for attacks to support ground operations.[65] FACs, also referred to as Joint Terminal Attack Controllers (JTACs) belong to the commander of the TACP and work at the unit level in order to provide a local commander with the level of precise control required in order to safeguard friendly forces and limit collateral damage while carrying out attacks on adversaries. The absence of a TACP and FAC qualified fighter pilots was recognized as a deficiency within the Canadian Air Force and Army. The Commander of 1 Canadian Air Division and the Commander of Land Force Doctrine and

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[63] Department of National Defence, *Board of Inquiry Minutes of Proceedings : Topic of Inquiry, A-10A Friendly Fire Incident 4 September 2006, Panjwayi District, Afghanistan*, (Ottawa, ON: Department of National Defence, 2006), 4.

[64] *Ibid.,* 5

[65] Joint Chiefs of Staff. Joint Publication 3-09.3 Joint Tactics, Techniques, and Procedures for Close Air Support (CAS), (Washington, DC: Joint Chiefs of Staff, 2003), GL-18.

Training Systems (LFDTS) jointly re-energized the tactical units of the Air Force and Army to better align the efforts of the fighter force and Army to better integrate in the units deployed to Afghanistan.[66]

Another follow-on effect to the experience gained by the Canadian Army from operations in Afghanistan was the requirement for realistic training in Canada prior to the deployment of forces to the theatre of operations. CF-188s from both 3 Wing Bagotville and 4 Wing Cold Lake have provided critical support to Army training at all levels from Basic FAC training to Battle Group validation exercises at the Combat Manoeuvre Training Centre at CFB Wainwright.[67] While the support that these fighters have provided Battle Groups have been key to the realistic training of Canadian soldiers prior to their deployment to Afghanistan, the fighter force is not any closer to having aircraft deployed to the same theatre.

To summarize, when the Canadian Forces deployed to Afghanistan, CF-188s were not included in the force package that was deployed to provide support for the Canadian Battlegroup. During the Cold War, the Canadian fighter force had been organized to fly in either NORAD or NATO missions that did not involve CAS missions. The only close operational contact between Canadian fighters and Mobile Command was through 10 TAG and the limited number of CF-116s that were in service. When these were retired from service, the Canadian fighter force accelerated a disengagement from operations with the Canadian Army that culminated in the operations that took place

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[66] LFDTS and 1 Cdn Air Division have been actively engaged in the revamping of CAS training within the Army and fighter force. In 2009, a Joint Standards Cell for CAS training was established at LFDTS HQ in Kingston with a CF-188 pilot on the staff.

[67] Scott Taylor, "Ex Maple Guardian," *Espirit de Corps, Canadian Military Then and Now* 15, no 5, (June 2008), 9.

during Operation Allied Force. The DCA and AI missions that CF-188s flew into Kosovo and Serbia during this conflict were seen as validation of the emphasis that had been placed in the fighter force on equipping for and training to mission types that followed the strategic principles of Col Warden's rebirth of strategic air power in his *The Air Campaign: Planning for Combat* that provided the blueprint for the air campaign of the 1991 Persian Gulf War. The experience of the Air Force's fighters since the end of the Second World War in training and operations were air centric. This emphasis did not fit into the joint capabilities that were required for CF-188s to fit into the deployment and battle plans of the Joint Task Force that deployed to Afghanistan. An additional impediment to the integration of Air Force and Army kinetic operations in Canada was the increased NORAD tasking level in the immediate aftermath of 11 Sep 2001 limiting the number of aircraft available for deployment.

The fact that CF-188s have not been deployed to Afghanistan to support Canadian soldiers engaged in fighting has been a missed opportunity to cement the bond between the fighter force and the Canadian Army. Fighter pilots have been trained and deployed as FACs working in TACPs and have provided critical support to ground commanders in Kandahar. Also, the inclusion of CF-188s in the training of soldiers in Canada prior to deployment has also helped close the tactical gulf that exists between the fighter force and the combat arms. The end of the CF-188 Incremental Modernization Programme, with increased interoperability systems and weapons, was a key milestone for the fighter force in its ability to conduct CAS missions with the latest technology and weapons available. The completion of these upgrades has to ensure the maximum lethality and effectiveness of the Hornet as a weapons platform for missions that fit into the ground

scheme of manoeuvre. Time will tell if the fighter force will be deployed in the future to provide the flexible kinetic effects that are the hallmark of air power; in air-to-air missions or air-to-ground missions that are not only AI missions but will also include CAS missions. A future deployment is contingent on the ability of the fighter force to demonstrate its proficiency and on the Canadian Forces including Air Force kinetic power in future Joint Task Forces. As will be shown in a subsequent chapter, these kinetic effects should not be confined to fighters but may also include some form of Unmanned Combat Air Vehicle (UCAV) as a weapons platform of the not-so-distant future.

CHAPTER 3 – Air Power Trends

The Canadian Air Force is not unique in how its air power has developed since the end of the Second World War. The onus that has been placed on the development of fighter capability to defend airspace and attack strategic targets is reflected throughout the air forces of NATO. The largest Western air force, that of the United States, has promoted with vigour the platforms that best allow conduct of operations as those exemplified in Operations Desert Storm and Allied Force. The missions in these operations, of which Canadian fighter pilots ably participated, were flown with massed formations of fighters, bombers and support aircraft penetrating into the airspace of the adversary to strike at targets that were determined to be key to ability of the enemy to fight. However, the conflict trends of the past decade are leaning away from high-intensity conflicts such as Operation Desert Storm and are showing the hybrid nature of contemporary conflict that is fought in a non-linear battle space in which air power can provide critical support to land forces.

Independent of the type of conflict, whether against the Taliban of Afghanistan or the Iraqi military, tangible trends have emerged that will dictate the effects that air power will have in the future and what roles aircraft will play in the conflicts of the future. The importance of control of the air has been reinforced as a trend that will continue with the move towards increasingly stealthy aircraft such as the F-22, billed as the world's first air dominance fighter. Second, the technology trends that indicate that aircraft are capable of delivering increasing precise weapons is a stark contrast to the kinetic effects that aircraft could deliver prior to the invention of Global Position System (GPS) guided munitions. Third, the reliance that commanders have on intelligence, surveillance and

reconnaissance (ISR) has grown with the move towards increasing networked forces. Persistent ISR in the form of long endurance UAVs started to have an impact over Kosovo and has developed to the point that UAVs are now integral to any deployed force. The final trend that is worthy of examination is how armed helicopters, such as AH-64 Apaches, fit into the equation of mobile attack capability throughout an area of operation for commanders in the future and how these aircraft can sustain substantial damage when not employed properly. The trend for the use of armed helicopters shows that they may be too vulnerable to ground fire when involved in higher intensity fighting.

As mentioned earlier, the Canadian Air Force has embarked on a process of renewed commitment to the role that air power can provide to the concept of joint fires in operations with the Canadian Army in order to have a visible impact on the battlefield. Joint Fires is the "…employment of forces from two or more components in coordinated action to produce desired effects in support of a common objective."[68] The motivation for this renewed energy is the realization of how vital to joint fires that air power has become. The ability to precisely strike targets with a compressed kill chain, the process from requesting an attack to delivering weapons on the target, has made the flexible response of air power a key component to the successful conduct of operations. In order to help chart the future for kinetic air power for the Canadian Air Force, the trends that have emerged over the last decade of air power operations will be discussed in turn starting with Kosovo through to the operations that are currently taking place in Afghanistan and the role of air power in the US-led invasion of Iraq in 2003. These air power trends will give an indication in how Canadian air power can develop and what

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[68] Joint Chiefs of Staff, *Joint Publication 3-0 Joint Operations*, III-17 – III-18.

platforms will be required of the Canadian Air Force to best contribute to joint fires to maximize the impact of air power in Canadian operations conducted as outlined in the *Canada First Defence Strategy*.

Air in the Latest Conflicts

Operation Allied Force, NATO's air campaign in Serbia, is an interesting case study in that it is the only recent conflict that was fought solely with aircraft and no ground troops. Allied Force started on 24 March 1999 to:

> …force [Serbian President Slobodan] Milosevic back to the negotiating table so that NATO could find a way short of independence to protect Kosovo's ethnic Albanian population from Serb violence and political domination. This bombing campaign, it was emphatically stated, was not a war, and none of the NATO leaders had any intention of waging one.[69]

The trends that emerged from Kosovo for joint fires are limited because of one simple fact; there were no joint fires in Allied Force due to the absence of a land campaign. Air power, in any shape or form, did not need to integrate into a ground scheme of manoeuvre and therefore the complex coordination of joint fires was not exercised at any point during the bombing campaign. In Kosovo, "…NATO's air war had two main thrusts: a strategic campaign against the Serb heartland and a tactical campaign against Serb forces doing the killing and the forced expulsions in Kosovo."[70] The strategic campaign was conducted along the same lines as those of Operation Desert Storm; the seizing of air superiority and then the systematic attack of targets in keeping with John Warden's theories that were used in 1991 in Iraq. The dominance of NATO over the Serbian Air Force allowed for the conduct of the operation on the terms that NATO

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[69] Ivo H. Daadler and Michael E. O'Hanlon, *Winning Ugly: NATO's War to Save Kosovo*, (Washington: Brookings Institution Press, 2000): 2.

[70] *Ibid.*, 4-5.

decided in its planning cycle. NATO had an "overwhelming superiority in air combat capability, air combat aircraft, sensors and battle management systems, and the strike capabilities needed for air base suppression."[71] The ability to wrest control of the air over Serbia and Kosovo was a reinforcement of the belief in the necessity to have air superiority, or better still air dominance, as a precursor to attacks on ground targets. The Serbian Integrated Air Defence System (IADS) was not destroyed but it was suppressed to the point that only two Allied manned aircraft were shot down without loss of life with an additional four Predator Unmanned Aerial Vehicles (UAVs) shot down. Serbian IADS was suppressed using dedicated Electronic Warfare (EW) aircraft such as EA-6B Prowler and F-16CJ equipped with jamming capability and armed with AGM-88 High Speed Anti-radiation Missile (HARM) designed to attack radar equipped air defence systems. [72]

In Operation Enduring Freedom in Afghanistan, Allied aircraft were not faced with an IADS of any description with which it had to contend. There were no systematic impediments from the Taliban to deny the use of airspace to aircraft other than through small arms and man-portable air-defence systems like shoulder launched surface-to-air guided missiles (SAMs). The free rein of not having to contend with enemy fighters or radar systems has allowed commanders the flexibility to concentrate air power when and where they choose.[73] Missions flown to integrate aircraft into joint fires can be time consuming when these attacks are to be made close to friendly positions to ensure that the

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[71] Anthony H. Cordesman, *The Lessons and Non-lessons of the Air and Missile Campaign in Kosovo*, (Westport: Praeger, 2001): 258.

[72] Daniel Haulman, *U.S. Unmanned Aerial Vehicles in Combat, 1991-2003*, (Maxwell AFB, AL: Air Force Historical Research Branch, 2003), 8.

[73] Eric Theisen, *Ground-Aided Precision Strike: Heavy Bomber Activity in Operation Enduring Freedeom*, (Maxwell AFB, AL: Air War College, 2003), 2.

proper targets are hit while minimizing the probability of friendly casualties. Enduring Freedom has shown the value in being able to dominate the airspace in a theatre of operations to maximize the impact that air power can bring to a fight.

During Operation Iraqi Freedom, Coalition aircraft again ruled the skies over Iraq but this was a carry over from the results of Operation Desert Storm. In 1991, Iraq fought back with fighters and surface-to-air missiles against the Coalition aircraft and cruise missiles that were attacking targets in Kuwait and Iraq as part of the operation to expel Iraq from Kuwait. Following the conflict, two areas were established as No-Fly Zones for the Iraqi Air Force. These zones were patrolled by a continuous presence of American and British fighters operating from bases close to Iraq in order to enforce the UN sanctions against Iraq. Iraqi air defence units were attacked if they threatened Allied aircraft. The December 1998 Operation Desert Fox, in addition to targets linked to the Iraqi Weapons of Mass Destruction Programme, also struck Iraqi air defence units to further degrade the ability of the Iraqi military to mount a defence against Allied aircraft. In the lead-up to the invasion of Iraq in March 2003, American forces started to attack Iraq starting in July 2002. Under a secret plan called Southern Focus, the commander of the Allied Air Component, USAF Lieutenant-General T. Michael Moseley "expanded the list of targets [that could be struck.] [This was done] as a way of compensating for the possibility that the air commanders might have little time to set the stage for a ground assault."[74] By the end of Southern Focus, the Americans "…dropped 606 bombs on 391 targets…" that included attacks on the Iraqi Air Defence Command at H-3 airfield in

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[74] Michael R. Gordon and Bernard E. Trainor, *Cobra II: The Inside Story of the Invasion and Occupation of Iraq,* (New York: Pantheon Books, 2006): 69.

Western Iraq.[75] Unlike Operation Desert Storm, the invasion of Iraq in 2003 was not preceded by weeks of punishing air attacks throughout the country. Iraqi Freedom's air campaign struck targets that had been identified to best support the ground commanders and not destroy the infrastructure of the country that would be vital to the new Iraqi government after the removal of Saddam Hussein from power.[76] These attacks were possible because of the dominance that the Coalition had in the skies over Iraq.

Operations over Kosovo, Afghanistan and Iraq show the importance of air superiority as a minimum and air supremacy as a goal for future operations. Air superiority is defined by NATO as the "degree of dominance in the air battle of one force over another which permits the conduct of operations by the former…at a given time and place without prohibitive interference by the opposing force."[77] Air supremacy is different in that the "…dominance of one force is not restricted to a given place and time but is complete in that the opposing force is incapable of effective interference."[78] The USAF F-22 is an example of an aircraft that is designed to dominate the air space in any theatre. It is the first fifth generation fighter that is designed to operate with impunity against advanced enemy fighters operating within a modern IADS with the most advanced SAMs. The F-35 Lightning II, also known as the Joint Strike Fighter, in development as the next generation strike aircraft to replace the current fourth generation aircraft such as the CF-188, also follows along the theme of designing an aircraft that

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[75] *Ibid.,* 69.

[76] *Ibid.,* 209.

[77] North Atlantic Treaty Organization NATO Standardization Agency, *AAP-6(2009) NATO Glossary of Terms and Definitions*, (Brussels: NATO Standardization Agency, 2009), 2-A-11.

[78] *Ibid.,* 2-A-11.

exploits technology to decrease the threat posed by an adversary's IADS.[79] The trend of dominating the air above a battlespace is a theme reinforced during the operations that have taken place to date in the 21st Century.

Towards the Best Weapon

The weapons used during Operation Allied Force showed the quickening pace in the trend towards the increased use of precision-guided weapons and precise weapons in modern operations. Precision-guided weapons guide on laser energy reflected off a target from either a ground or air designator to hit a target. These weapons require a clear line-of-sight to the target during critical parts of the trajectory of the weapon to successfully guide to the target. Precise weapons use information from GPS satellites to determine the weapons location with respect to the calculated position of the target in order to strike a selected aim point and do not require further human action to guide to the target. During Operation Desert Storm less than 10% of the weapons employed were precision-guided weapons.[80] During Operation Allied Force, this percentage had increased to approximately 33% and included the employment of GPS-guided bombs, such as Joint Direct Attack Munition (JDAM) and cruise missiles on a large scale from a variety of aircraft from fighters to strategic bombers such as B-2 Spirits that flew missions direct from their base in Missouri.[81] This percentage grew even more during Operation Iraqi Freedom to having the overwhelming majority, almost 70%, of the

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[79] Bill Sweetman, *Ultimate Fighter: Lockheed Martin F-35 Joint Strike Fighter*, (St. Paul, MN: MBI Publishers, 2004), 52.

[80] Anthony H. Cordesman, *The Iraq War: Strategy, Tactics and Military Lessons*, (Westport: Praeger, 2003): 279.

[81] Cordesman, *The Air and Missile Campaign in Kosovo*, 97.

weapons dropped being either laser or GPS-guided munitions.[82] Combined laser and GPS-guided weapons are now in the Canadian Air Force arsenal. They can be dropped using either of the two guidance systems that is best suited for the attack required and the environmental conditions of the day. Current non-linear battlespace, such as typified in Operations Enduring Freedom and Iraqi Freedom, demand joint fires of unprecedented precision that can only be accomplished through the employment of guided munitions to avoid friendly casualties or unwanted collateral damage to property. The upward trend in the requirement for guided weapons for integration into joint fires will not decrease in the 21st Century. In fact, air forces may get to the point that the only unguided weapons used will be direct fire weapons such as the 20mm Vulcan Cannons that equip fighters such as the CF-188.

Deadly Persistence

The trend in better integrating air power into joint fires has not come from new and advanced manned aircraft but in the guise of increasingly sophisticated and capable UAVs. The technological development has reached the point that these aircraft have become vital to the air and land commander's view of the battlespace. UAVs have developed from the surveillance drones first used in large numbers in Desert Storm at the tactical level like the Pioneer to the strategic assets such as the Global Hawk, whose endurance is measured in tens of hours and are capable of flying at altitudes once the realm of the reconnaissance aircraft such as the SR-71 and U-2. The RQ-1 Predators that were used in Allied Force provided commanders with a real-time view of events in Kosovo with images sent back to the Combined Air Operations Centre (CAOC) in Italy

[82] Cordesman, *The Iraq War: Strategy, Tactics and Military Lessons*, 279-280.

that directed the air campaign.[83] The Predators were used to identify targets and start what became the time-sensitive-targeting (TST) process to identify targets, obtain permission to strike and then attack something that was first identified by the UAV. There were shortfalls in the equipment, such as the inability to provide commensurated waypoint information of a target of sufficient fidelity to allow for attack by GPS-guided bombs, but technology has advanced to minimize these shortfalls in order to maximize the utility of these assets.

Modern UAVs like MQ-9 Reapers provide commanders with persistent ISR coverage that has also grown to include an added bonus for the ground commander. Upgraded MQ-1 Predators have been armed with AGM-114 Hellfire missiles while the MQ-9 Reaper, a larger version of the Predator, is armed with a combination of both Hellfire missiles and guided 500 lb bombs. These armed UAVs were first used in the initial stages of the Global War on Terror to great effect. An AGM-114 fired from a Predator struck a truck in Yemen and killed a high ranking Al'Qaida commander in 2002.[84] This was the first documented case of a UAV being used to strike a target successfully but these missions have become commonplace in Iraq and Afghanistan since that time. In addition to being able to provide deadly persistence to the joint fire equation, UAVs are able to move above the battlespace without giving away their

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[83] Haulman, *U.S. Unmanned Aerial Vehicles in Combat, 1991-2003,* 4-5 .

[84] Carl Doyon, "Replacing the CF-18 Hornet: Unmanned Combat Aerial Vehicle or *Joint Strike Fighter*?" *Canadian Military Journal* 6, no 1 (Spring 2005), 35.

position. Loitering at altitude above an area of operations, UAVs can capitalize on both their low visual and noise signatures to remain undetected to those on the ground.[85]

UAVs "…are coming of age in an era of data networking and they are taking full advantage of this technology."[86] In fact, the move to more network based command and control systems has highlighted the benefits of including UAVs in the ISR design of a campaign: "…net-centric operations enable…UAVs and networked munitions to conduct missions more effectively and increase the effectiveness of manned and space platforms."[87] In Operation Iraqi Freedom, Global Hawks were "...used in 55% of the TST missions against enemy air defence equipment" as an example of how the capabilities of UAVs can be optimized to help manned aircraft target enemy units that may deny their full and free use of airspace.[88] An indication of the trends in the development of UAVs, the USAF believes that:

> [w]eaponized unmanned systems can, in certain circumstances, provide lower-cost, lower-risk alternatives to manned missions. Operating in strike packages with manned aircraft or other unmanned aircraft, armed…UAVs can carry out destruction or suppression of enemy air defense missions by using a combination of kinetic and non-kinetic weapons.[89]

Of the major trends in the development of air power contributing to joint fires, the development and employment of armed UAVs is by far the most significant trend witnessed to date.

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[85] Luther S. Turner, Jason T. Adair and Louis Hamel, "Optimizing Deadly Persistence in Kandahar: Armed UAV Integration in the Joint Tactical Fight," *Colloquium* 2, no. 2 (June 2009), 7.

[86] United States, United States Air Force, *The U.S. Air Force Remotely Piloted and Unmanned Aerial Vehicle Strategic Vision*, (Washington, DC: U.S. Air Force, 2005), 7.

[87] *Ibid.,* 7.

[88] *Ibid.,* 2.

[89] *Ibid.,* 9-10.

The Canadian Air Force has recognized this trend and but has not yet introduced to service an armed UAV along the lines of the MQ-1 or MQ-9. The CU-161 Sperwer has been replaced in Afghanistan with the CU-170 Heron UAV operated by the Canadian Air Force. The Heron provides a more persistent ISR capability than that offered by the Sperwer and can remain on station for 24 hours to provide support to ground commanders. The limited capabilities that the Sperwer provided, in terms of ISR functionality and persistence, gave rise to the requirement for the Canadian Air Force to field a UAV that better supported the requirements of ground commanders. A major improvement in the ISR functionality that the Heron provides that the Sperwer did not is the Remotely Operated Video Enhanced Receiver (ROVER) System.[90] A unit on the ground equipped with a ROVER System is able to receive the images transmitted from the imaging system of whatever system is transmitting the images. This capability allows FACs to specifically highlight targets for attack using the images provided from above. Ground commanders can also use this system to help provide situational awareness of what is happening in an area beyond their observation due to distance or terrain.[91] The Canadian Air Force is well placed to make a significant advance in the persistent support that it can provide to joint fires through the exploitation of the capabilities that are now being shown possible with modern UAVs.

The final trend for discussion is the development of armed helicopters for the inclusion in the joint fires equation and when these aircraft are best employed. The "…standard for the middle and great powers within the Western alliance" is to include

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[90] Details of the sensing capability of the CU-170 Heron are discussed at http://www.casr.ca/101-af-cu170-heron-uav.html.

[91] *Ibid.*

these versatile aircraft in the combat fleets of their militaries; whether as part of their Army or Air Force.[92] As such, ground commanders have come to rely on the flexibility that these platforms play in the delivery of timely fire support to the ground scheme of manoeuvre. This is especially true in the US Army that has fielded dedicated attack helicopters since the Vietnam War and now uses the AH-64 Apache as its main attack platform. The impetus for the development of these aircraft is that the ground commander can exercise direct control over a platform that is organic to its organizational structure. This is an understandable conclusion that, while it may be a source of friction between air and ground commanders, is almost irrelevant. As will be discussed in the next chapter, what is most important for the role of air power in the provision of support for joint fires is not what platform provides kinetic support in conflict but what type of kinetic support. In essence, this is an "…effects based approach that starts with the desired outcome…and then determines the resources needed to achieve them."[93]

The Missing Piece – Armed Helicopters

In operations in Afghanistan and Iraq, armed helicopters have done yeoman service in the provision of joint fires. However, some shortcomings of these aircraft have been noted that suggest that armed helicopters, while they do have an extremely important role to play in kinetic operations, cannot operate with impunity on the battlefield and at times are not the best platform to provide the required support to ground

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[92] Thierry Gongora and Slawomir Wesolkowski, *What Does a Balanced Tactical Helicopter Force Look Like?* (Government of Canada, 2008): 9.

[93] J.P.Hunerwadel, "The Effects-Based Approach to Operations," *Air & Space Power Journal* Spring 2006: 57.

operations. Experience has shown that helicopters are susceptible to ground fire due to the low altitudes and slower speeds that they operate when flying either CAS or Close Combat Attack (CCA).[94] This is not to suggest that armed helicopters have no place on the battlefield but is a recognition of the fact that commanders need to weigh risks and benefits when deciding which platform will provide joint fires when it is required.

Operation Anaconda, conducted in the Shahi Kot valley in eastern Afghanistan from 2-16 March 2002, is a now classic example of the emerging face of battle that is fought on non-linear battlefields that require the full integration of joint fires. This operation to clear the Shahi Kot valley of remaining al-Qaeda and Taliban forces was at the end of the opening stage of operations in Afghanistan.[95] Over the two weeks of the battle, involving troops from 8 countries, including Afghanistan, "…bombers, fighters, helicopters and AC-130 gunships delivered CAS into the postage-stamp size battle area measuring about 8nm x 8nm." As an indication role that CAS played, in the first 72 hours alone of the operation, over 750 bombs were dropped into this small area.[96] All of the AH-64s that took part in the opening phase of the operation, "…took damage. By the end of the day, four had returned to the forward arming and refuelling point (FARP), while three remained in action despite battle damage."[97] The CAS support to the fight in the valley was so intense that, over the span of the operation, an average of 235 bombs per day were dropped in addition to strafing from fighters and fire support from attack

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[94] CAS and CCA are the same mission but the US Army uses the CCA description so as to not infringe on the Key West Agreement that outlined the roles and missions that the USAF and USA would fulfill.

[95] United States, United States Air Force, *Operation Anaconda: An Air Power Perspective*, 3.

[96] *Ibid*.,7.

[97] *Ibid*., 66.

helicopters and AC-130 Spectres.[98] This gives testimony to the vital role that air power played in this fight. The troops that were engaged in the fight did not have organic artillery support and depended on CAS to provide them with the firepower that they required to win firefights and defeat their adversaries.

The next chapter will discuss how doctrinally the tasking of air power in joint fires did not work as efficiently as could have because of a lack of focus on the effects that were required rather than on what platforms were providing the support. The Air Force was not involved in the planning of support for the operation until only five days prior to the planned start date for the battle. This meant that "[n]either the land nor air component did all they needed to do to put a theatre air control system in place to handle close air support requests."[99] Therefore, the airborne assets that were to make "…up for the lack of ground-based combined arms elements" defaulted to the organic air support of the AH-64 that the US Army could task as the lead nation in the planning.[100] The intensity of small arms fire and rocket propelled grenades (RPGs) decreased the employment of the Apaches due to the damage that they received and the controllers directing the CAS had to rely on joint fires from fighters, bombers and AC-130s to provide them with the support they required without exposing the crews to unmanageable risk. In Operation Anaconda, it was not that armed helicopters could not provide the joint fires required but more an example of fixed-wing platforms being available that

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[98] *Ibid*., 101.

[99] *Ibid*., 6.

[100] Collin T. Ireton, "Shifting the Air Force's Support Ideology to Exploit Combined Arms in the Close Fight," *Air & Space Power Journal* (Winter 2008): 87.

were able to provide the same support without the same risk; this meant that the helicopters were not used as much.[101]

In another example of how exposed helicopters can be to ground fire is the now infamous attack on the Iraqi Medina Division on 24 March 2003 by AH-64s of the 11th Aviation Regiment. On their attack, "…the helicopters encountered heavy small arms and light anti-aircraft fire before they closed on the Iraqi armor, and had to retreat back to base after doing minimal damage."[102] The changes that the US Army instituted after that failed attack was not to the equipment but in the employment, ensuring the best effect, that armed helicopters could provide. Apaches were used in attacks behind the front line, in so called deep attacks, but they were most successful and provided the best effects to the ground commanders when they were used as armed scouts to either secure a flank providing mobile firepower in the ground scheme of manoeuvre.[103] The failed attack of 24 March 2003 shows the damage that an alerted enemy can do to a helicopter raid when the "…objective of their attack [becomes] clearly predictable…."[104] Therefore the trend in the use of armed helicopters is not to discount their utility but to ensure that these critical platforms are used in missions that require their unique capabilities.

In essence, all of these trends discussed are continuations of the evolution of air power and what it brings to a fight. Air power needs to be responsive to the requirements of a conflict to be "…capable of delivering scalable destructive power with a variety of kill mechanisms where ground forces need them and when they need them – all the while

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[101] *Ibid.,* 87.

[102] Cordesman, *The Iraq War,* 318.

[103] *Ibid.,* 320-321.

[104] *Ibid*., 321.

surviving the possible battlefield threats."[105] By surviving the threat to provide weapons on targets, air power will be able to "…employ weapons close to or far from…troops, day or night and in poor weather."[106] In the next chapter we will see how doctrine and employment of air power is evolving from the lessons learned during the last conflicts of the Western powers. The attainment of air supremacy has remained as a cornerstone for the conduct of operations on land, sea and air. The capabilities that precision and precise weapons bring to joint fires denotes a marked difference in the effectiveness of air power in kinetic operations. This realization is recognized in the doctrinal changes to joint fires that have decreased the safety distance to friendly troops that FACs can use when calling for joint fires when using LGBs or GPS-guided weapons. The persistent ISR that UAVs of differing types has become as important to operations as maintaining air supremacy. Without ISR feeding information into the intelligence and targeting cycle, air power would not be as effective as it is now. Finally, when tasked and employed properly, armed helicopters can provide incredible support to ground commanders. The freedom of manoeuvre and firepower that these aircraft bring to a battlefield cannot be equaled because of how closely they can be integrated into the ground commander's plans. The future of air power in the joint fires equation is bright and subsequent chapters will demonstrate how the Canadian Air Force will be able to provide the effects that are required by the Canadian Army to allow it to operate with the support provided by air power through joint fires.

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[105] Ireton, "Shifting the Air Force's Support Ideology to Exploit Combined Arms in the Close Fight," 88.

[106] *Ibid*., 88.

CHAPTER 4 – Improving the Joint Fight

In the previous chapter, the latest trends that have emerged in the use of air power were discussed in order to set the foundation to discuss how these trends will contribute to the future of air power and its ability to provide kinetic effects on the battlefield of tomorrow. This issue is important to discuss because it is from this assessment of the future of air power's effects on the battlefield that the future of Canada's Air Force can be examined. This is especially timely for the Canadian Air Force with the examination of the future of UAVs in the Air Force, the coming replacement of the CF-188, the deployment of CH-146s to Afghanistan, and the primacy of the defence of Canada in the *Canada First Defence Strategy*. In order to place all of these factors in context for Canada, it is first important to discuss the cumulative effects of the current trends in the evolution of kinetic air power and its ability to make a contribution in areas of operations.

The easiest way to summarize how the role of air power in joint fires is viewed is, at the most basic level, simply being the increased cooperation and integration with land forces. This emerged in embryonic form during Operation Desert Storm but did was not fully identifiable until the recent Operations Enduring Freedom and Iraqi Freedom. In Operation Desert Storm, the designers of the air campaign reluctantly moved away from the strategic campaign along Warden's model of not holding air power as subordinate to land power but capable of striking at the heart of an adversary's military and society to carry the fight.[107] The missions that were flown by air power to support land forces in their ground offensive, from CAS missions from A-10s and Marine aircraft to CCA missions by AH-64s, were not viewed as important as the attacks independent of the

[107] Olsen, "Operation Desert Storm, 1991," 182.

ground scheme of manoeuvre.[108] This isolation of air power from the land forces was not limited to the 1990s but continued with Operation Allied Force and permeated its way through the Canadian fighter force, as discussed in an earlier chapter. Operation Enduring Freedom placed this paradigm of independent air forces attacking targets beyond the front lines on its head and forced leaders with the Western Air Forces to seriously study the role of air power in joint fires. Operation Iraqi Freedom, and the continuation of operations in Iraq and Afghanistan into 2010, served to reinforce the realization that air power is required as a cornerstone in joint fires. In order to remain relevant, air power needs to integrate into joint fires as an equal partner with land forces in contemporary and future battlespaces. The advocates of air power employed along lines of operations separate from ground forces are becoming fewer as the lessons of Operations Enduring Freedom and Iraqi Freedom become fully assessed and included in doctrine.

USAF Counterland Doctrine

The USAF is aggressive in its development of doctrine for the employment of air power in contemporary operations. The USAF views air power, combined with space enablers, as a form of "aerial maneuver that seeks to shatter an enemy's fighting ability through focused attacks against key enemy military targets."[109] The latest version of the USAF Counterland Operations Doctrine was published in 2006 after the inclusion of the lessons gleaned from Afghanistan and Iraq. What is interesting to note is how some vestiges of parochial service interests remain in the Counterland Doctrine of the USAF

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[108] *Ibid.,* 195-196.

[109] United States, United States Air Force, *Air Force Doctrine Document 2-1.3 Counterland Operations,* (Washington, DC: U.S. Air Force, 2006), 2.

with regards to the division of the mission sets between AI and CAS. The friction between these missions is not rooted in a denial of the requirement for these missions but is more centred on the debate on the coordinating authority is for missions in a battlespace. Both CAS and AI can be used in aerial manoeuvre to attack an enemy but these missions, whether flown as pre-planned or reactive, can change in nature depending on the effect that they are designed to meet. This friction harkens back to the ongoing debate of whether air power is aerial artillery for the ground commander or whether air power, in AI missions, is best employed against targets that are identified as key to the enemy following the Warden school of thought.

The USAF defines CAS as "air action by fixed- and rotary-winged aircraft against hostile targets that are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces."[110] There is no debate that CAS needs to be highly controlled in order to mitigate the risk of hitting the wrong target and attacking friendly troops rather than the adversary.[111] Coordination for CAS is done in the planning stages using TACPs at all levels of command and with FACs as the final authority for the release of weapons. Doctrinally the definitions of CAS are well understood, as are the benefits that CAS offers a Joint Force Commander. Air power provides "…speed, range and maneuverability [sic] to allow CAS assets to attack targets that other supporting arms may not be able to engage effectively."[112] Therefore, air power provides a ground commander with vital firepower support to

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[110] United States Air Force, *Air Force Doctrine Document 2-1.3 Counterland Operations*, 6.

[111] *Ibid*., 7.

[112] *Ibid*., 6.

"…halt attacks, help create breakthroughs, destroy targets of opportunity, cover retreats and guard flanks."[113]

AI is the other half of the defined Counterland Operations Doctrine. AI is designed to "…attack the enemy's ability to fight by targeting tactical and operational forces and infrastructure…. AI is conducted at such distance from friendly forces that detailed integration of each air missions with the fire and movement of friendly forces is not required."[114] For the air power purists, AI is the ultimate mission for kinetic effects following the air power theories of Warden, Mitchell and Trenchard.[115] AI is viewed as operations to "…divert, disrupt, delay or destroy the enemy's military potential before it can be brought to bear effectively against friendly forces…."[116] It is recognized that AI is a powerful mission set that can have a profound impact in the conduct of a campaign. The development of persistent ISR to find targets of opportunity, such as the use of Global Hawks in Operation Iraqi Freedom to find Iraqi Air Defence Systems, and the integration of more precise weapons has made AI a high demand mission because of the effects it can deliver. The friction in AI comes therefore in how the target sets are determined for AI and to what ends are they attacked. AI missions can be used to follow

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[113] *Ibid*., 6.

[114] *Ibid*., 5.

[115] For more on these Air Power theorists, the USAF Air University has compiled a collection of internet resources at http://www.au.af.mil/au/aul/school/asbc/airtheo.htm which provides a collection of articles for these and other air power theorists.

[116] United States Air Force, *Air Force Doctrine Document 2-1.3 Counterland Operations*, 5.

an air campaign that compliments the ground objectives or they can be flown in support of the ground campaign, in what are called shaping operations.[117]

Optimizing CAS

The debate over the control of AI and CAS missions is rooted in the defined demarcations between these two mission sets. In the describing of these two missions, the distinguishing definition relates to the interaction between aircraft and friendly troops. Many different procedural methods are used in warfighting to deconflict friendly troops to avoid fratricide and air power is not separate from this procedural requirement.[118] As is often the case in air control measures, a procedural line is often established to allow for the safe, effective conduct of operations. The line that generally marks the difference between AI and CAS missions is the Fire Support Coordination Line (FSCL). Usually, any missions inside of the FSCL to the position of friendly troops are CAS missions that must be controlled by a FAC. Missions flown beyond the FSCL are generally AI missions that do not require the coordination with friendly troops, unless friendly troops are operating beyond the FSCL such as Special Forces.[119] It can be seen that the crux of the friction between CAS and AI is not the requirement and definition of these missions but the placement of the FSCL. The FSCL used to be defined using identifiable geographic features that were easily identifiable from both the air and ground. The integration of GPS navigation into air and land forces has rendered this method moot.

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[117] Charles Kirkpatrick, *Joint Fires as They Were Meant to Be: V Corps and the 4th Air Support Group Operations Group During Operation Iraqi Freedom,* (Arlington, VA: The Institute of Land Warfare, 2004), 2-3.

[118] United States, Joint Chiefs of Staff, *Joint Publication 3-09.3 Joint Tactics, Techniques, and Procedures for Close Air Support (CAS),* (Washington, DC: Joint Chiefs of Staff, 2003), I-4.

[119] United States Air Force, *Air Force Doctrine Document 2-1.3 Counterland Operations*, 71.

With precise navigation, the FSCL can be set using points of longitude and latitude. The FSCL can therefore be defined at a line that marks the range of the organic tube-artillery that a ground commander controls.[120] This is important to define because beyond the range of tube-artillery, a ground commander will not be able to attack targets and therefore will not be firing indirect weapons into the same airspace in which friendly aircraft are operating.

The ideal of a FSCL set and defined in advance of friendly troops works well in linear operation battlespaces:

> Linear operations are normally conducted against a deeply arrayed, echeloned enemy force or when the threat to LOCs [line of communications] reduces friendly force freedom of action. In these circumstances, linear operations allow commanders to concentrate and integrate combat power more easily.[121]

The examples given for linear operations are the two World Wars, the Korean War Operation Desert Storm and initial stages of Operation Iraqi Freedom. These actions were all major force-on-force high intensity operations that had definable boundaries between friendly and enemy forces. However, Operation Enduring Freedom did not involve the classic high intensity operations; the lines between friendly and enemy forces, along with non-combatants, were blurred.

This blurring of the lines is defined as nonlinear operations. In nonlinear operations:

> …forces orient on objectives without geographic reference to adjacent forces. Nonlinear operations typically focus on multiple decisive points and are characterized by noncontiguous operations. Nonlinear operations

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[120] *Ibid*., 70.

[121] *Ibid.,* 65-66.

> emphasize simultaneous operations along multiple lines of operations from selected bases.[122]

In nonlinear operations, without proper control of joint fires the potential for fratricide is greatly increased because of the lack of easily identifiable friendly positions. Even before the fall of Baghdad, Operation Iraqi Freedom was showing a trend towards nonlinear operations. Operation Enduring Freedom is the epitome of nonlinear operations; the Canadian Battle Group in Kandahar province continues to operate from many different Forward Operating Bases (FOBs) from which they conduct the fight against the insurgency.[123] Air power therefore needs to be responsive to this way of fighting to ensure that it contributes most efficiently and effectively. These nonlinear operations fit the model of Hybrid Warfare discussed earlier as the face of conflict in the future.

The FSCL is still a valid concept for use in nonlinear operations. However, this line needs to be placed "…where the preponderance of effects on the battlefield shifts from the ground component to the air component. In this way, the FSCL placement maximizes the overall effectiveness of the joint force…. History has shown that placing the FSCL too deep is detrimental to overall joint force effectiveness and may even provide the enemy sanctuary from effective air attack."[124] The purpose of doctrine is to provide forces with a departure point from which it can develop tactics training and procedures (TTPs) that best allow weapons to be brought to bear on the enemy. For that

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[122] *Ibid.*, 66.

[123] The various Canadian Battle Groups that have operated in Kandahar Province have placed different emphasis on FOBs and Patrol Bases but operations by Canadians in Kandahar Province have used FOBs as forward staging bases for fighting the insurgency.

[124] United States Air Force, *Air Force Doctrine Document 2-1.3 Counterland Operations*, 69.

reason, doctrine should not be an impediment to carrying the fight to the enemy but should compliment it.

While the ideal of the FSCL is sound, it needs to be adapted to the modern dynamic of mobile warfare on a scale not managed before on a battlefield. Using the term FSCL comes with a cultural context that is different depending on which perspective is used as either from a land or air point of view. A clean break from this parochial view of the FSCL is required and it can leverage off work already done by other services. The United States Marine Corps (USMC) uses the term Battlefield Coordination Line (BCL) as the delineation between AI and CAS missions. The BCL is set to the maximum range of organic artillery and can therefore be easily adopted by air forces and land forces alike.[125] The doctrinal debate is important to resolve because it serves as a measure of how best to use air effects to provide kinetic support to land forces. In hybrid warfare, the mixture of high and low intensity warfare requires soldiers to carry the fight to the enemy and stabilize a theatre of operations; it cannot be done with air power alone but as a compliment to the lines of operations on the ground.

When examining the direct support that air power can provide a ground commander, the support provided by CAS far outweighs the support afforded by AI. The doctrinal definition of these missions clearly shows this, as does the practical application of CAS on the modern battlefield. This is especially true with the kinetic effects that air power brings to the contemporary fight. It has been "…the success of air power in providing day, night, adverse-weather precision support for ground forces [that] has convinced the [US] Army leadership that it can make its forces more deployable and

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[125] *Ibid.*, 71.

agile by reducing its own artillery support and relying more heavily on air power."[126] CAS has evolved quickly since the end of the Cold War because of the different context in which aircraft would be integrated into joint fires on the battlefield. The lessons from Operations Enduring Freedom and Iraqi Freedom solidified the maturity of air power in counterland CAS missions. This maturity has benefited from new precise weapons, GPS navigation and improved ISR that provides commanders with a better appreciation of the fighting on the ground.

Lessons learned in the employment of CAS have led to the development and use of the concept that CAS can be applied using three varying levels of control from the FAC. The first, Level 1 CAS, is the most restrictive and Level 3 CAS is the least restrictive. The objective is "…to offer the lowest level supported commander…the latitude to determine which type of terminal attack control best accomplishes the mission."[127] Before the maturity of counterland doctrine and the realization of the increased utility of CAS, there was only one method of delivering CAS effects using FACs that was akin to the contemporary Level 1 CAS.

As mentioned, Level 1 CAS is the most restrictive form of CAS and is used when friendly troops are in close contact with the enemy. In fact, GBU-12 LGBs can be used as close as 200 metres in combat without having to make the additional caveat of "Danger Close" for the engagement. Declaring "Danger Close" means that a ground commander is accepting the increased risk of friendly casualties from the explosion of

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[126] Bruce R. Pirnie et al., *Beyond Close Air Support : Forging a New Air-Ground Partnership* (Santa Monica, CA: RAND Corporation, 2005) 3.

[127] United States, Joint Chiefs of Staff, *Joint Publication 3-09.3 Joint Tactics, Techniques, and Procedures for Close Air Support (CAS),* V-14.

weapons close to the friendly positions. In fact, accepting the risk of 10% friendly casualties, a FAC can control attacks into 75 metres with a GBU-12 LGB as an example of the faith that ground commanders have in the precision of CAS using guided weapons.[128] FACs use "…Type 1 control when the risk assessment requires them to visually acquire the attacking aircraft and target under attack."[129] Type 1 CAS is the most time consuming because it requires the FAC to pass the target coordinates to the attacking aircraft and then ensure verbally that the aircrew identify, either visually or using targeting systems such as FLIR pods, both the friendly and target locations. Type 1 CAS is used when the target is closest to friendly troops so the FAC needs to "…ensure the attack will not affect friendlies by visual acquisition and analysis of attack geometry/nose position to determine weapon impact point." Before the "…recent technological advances in aircraft capabilities, weapons systems and munitions…" this method of CAS was the only means available to FACs to attack targets with aircraft. [130]

To cut down on the time to deliver weapons, other methods of controlling CAS assets has been developed. The impetus for developing other CAS TTPs was not energized alone but cutting down on the time delay of Type 1 CAS in the kill chain. The employment of UAVs in CAS has made it more difficult for FACs to visually acquire the target because of the small size and quietness of the aircraft; these attributes are both advantageous for attacking enemy forces without making them aware of an impending attack. Following from Type 1 control, "…Type 2 control [is] used when the [FAC]

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[128] *Ibid.,* D-2.

[129] *Ibid.,* V-14.

[130] *Ibid.,* V-16.

desires control of individual attacks but assess that either visual acquisition of the attacking aircraft or target at the weapons release is not possible…."[131] This form of CAS takes advantage of recent technology using "…digital or data link systems capable of displaying aircraft track, sensor point of interest [to] significantly enhance situational awareness that better enable the [FAC] to authorize weapons release…."[132] This form of control, which has also become associated with systems CAS is especially interesting because a FAC does not need to be physically with the troops to control the terminal attack. Using data link systems such as Remotely Operated Video Enhanced Receiver (ROVER), properly equipped receivers on the ground are able to view streaming video transmitted from an aircraft's targeting pod to ensure that the proper target has been identified. This method of attack is can be very efficient and provide very quick attacks on threats to friendly forces.

The final method for controlling CAS aircraft is Type 3 control. This method of control "…may be used when the tactical risk assessment indicates that CAS attacks impose low risk of fratricide. When commanders authorize Type 3 control, [FACs] grant a 'blanket' weapons release clearance to an aircraft or flight attacking a target…."[133] While Type 3 control is the least restrictive, it is also the least used because, while the FAC maintains the authority to abort attacks, the FAC does not have as close control over individual attacks by aircraft like in the other two control methods.

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[131] United States, Joint Chiefs of Staff, *Joint Publication 3-09.3 Joint Tactics, Techniques, and Procedures for Close Air Support (CAS*), V-15.

[132] *Ibid.*, V-15.

[133] *Ibid.*, V-15.

Kill Boxes and Keypads – Air to Ground of the Future

CAS control has therefore evolved to take advantage of modern technology such as guided weapons, UAVs and ROVER. While these control types have improved the TTPs for counterland missions directly supporting ground troops, procedural steps have also improved despite the friction generated by defining the placement of the FSCL. The two most important improvements have come from the development of Kill Boxes and Keypad CAS. Kill Boxes are a development of Type 3 CAS with Keypad CAS serving as a subset of Kill Boxes that allow FACs to control aircraft over a greater area of the battlespace. Both of these procedural methods require high situational awareness of the location of friendly forces throughout an area of operation. These new procedures "…focus on effects by implementing design elements specifically put in place to enhance the prioritization and synchronization of joint fires and maneuver to achieve the objectives of the JFC [Joint Forces Commander] across the entire theatre."[134] These procedural methods allow for the systematic division of an area of operations without becoming restricted by the location of the FSCL in nonlinear operations.

Kill Box and Keypad establishment is possible with the precise navigation that GPS affords modern aircraft. Areas of operations can be divided into 30 nautical mile by 30 nautical mile kill boxes based on the Area Reference System (ARS). ARS is an "…operational-level administrative measure used to coordinate geographical areas rapidly for battlespace deconfliction and synchronization."[135] The standardized battlespace area reference system is the Global Area Reference System (GARS). GARS

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[134] Jody Jacobs *et al*., *Enhancing Fires and Maneuver Capability Through Greater Air-Ground Joint Interdependence,* (Santa Monica, CA: RAND, 2009), xiii.

[135] United States Air Force, *Air Force Doctrine Document 2-1.3 Counterland Operations*, 72.

uses a "…grid system with a simple, universal identifier recognizable by each component and their associated command and control (C2) and attack assets. Three numbers followed by two letters describe a unique 30-minute by 30-minute area. …GARS is highly useful in facilitating rapid attacks on TSTs and for expediting deconfliction of friendly force locations…."[136] A kill box uses these GARS but adds a third dimension in altitude to delineate an area reference for joint fires. When established, "…the primary purpose [of kill boxes] is to allow air assets to conduct interdiction against surface targets without further coordination with the establishing commander and without terminal control."[137] Kill boxes can be further broken down to 10 nautical mile by 10 nautical mile keypads that provide ground commanders more flexibility in employing aircraft in joint fires. For example, one quadrant of a kill box can be closed to air attack due to the presence of friendly troops but another quadrant can remain open for air attack that does not require terminal control from a FAC. The flexibility afforded by these procedures capitalizes on the flexibility of air power to rapidly move above a battlespace and deliver air effects in a campaign:

> A combination of kill box and traditional FSCMs [Fire Support Coordination Meassures] is possible, such as when a single large advance is made from a classic linear battlefield (such as operations during OIF). Here the standard FSCL could be used for the slower moving ground forces, and localized JFLCC [Joint Force Land Component Commander] kill box system could be created in front of, or behind, a rapid advance. This allows for more efficient air attack on non-engaged enemy land forces…especially during non-linear operations.[138]

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[136] *Ibid*., 73.

[137] *Ibid*., 74.

[138] *Ibid*., 77.

Kill Boxes can be fully exploited only with the cooperation of both land and air commanders to defeat an enemy's force, whether massed or in small parties, no matter what the nature of the conflict in order to achieve victory.[139]

The effectiveness of these new coordination procedures hinges on the placement of the dividing line between AI and CAS. A ground commander will want to maximize the size of his AO and make it large enough to employ all of the organic assets under his control. In Operation Iraqi Freedom, the JFLCC set the AO for V Corps "…to allow the component commander to employ [his] organic, assigned and supporting systems to the limits of their capabilities."[140] This meant that the ground commander used air power for Corps shaping under close control because the FSCL was set at times 100km beyond friendly troops. While Kill Boxes were established, they were not often opened because of the deep placement of the FSCL did not allow for the flexible use of air power to attrit the adversary's force before coming into contact with friendly troops. In fact, manoeuvres by the US Army on the battlefield on the move to Baghdad did flush out formed units of the Iraqi Army. Kill Boxes were opened and air power was able to attrit enemy forces to the point of rendering them combat ineffective such as the Iraqi 10th Armoured Brigade on 2 April 2003.[141]

From the perspective of the air commander, AI is the best method to attack an adversary beyond the range of ground joint fires. However, the fact that air commanders do not want to "…integrate [themselves too] deeply with ground operations likely reflects

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[139] Jacobs et al., *Enhancing Fires and Maneuver Capability Through Greater Air-Ground Joint Interdependence*, 15.

[140] *Ibid*., 12.

[141] Kirkpatrick, *Joint Fires as They Were Meant to Be: V Corps and the 4th Air Support Group Operations Group During Operation Iraqi Freedom*, 15.

a culture wary of jeopardizing its independence – and of relinquishing its newly realized capacity to be decisive in theatre-level counterland operations."[142] From the view of an air commander, the only way that air power will be able to truly exploit the range and speed of aircraft above a battlespace will be through the use of AI missions to exploit the "…operational opportunities created by enemy forces uncovering themselves in reaction to ground maneuver."[143]

It is this last theme, the engagement of enemy forces reacting to the movement of friendly troops, which is the key to the increased cooperation between joint commanders in the pursuit of victory on the battlefield. Doctrine needs to evolve to become truly joint and exploit the unique capabilities that different services bring with them. At times, a ground commander may be supported by air power providing joint fires in CAS; conversely an air commander may be a supported commander with friendly ground forces manoeuvring to flush out adversary forces thereby exposing them to air attack.[144] Friendly troops, such as Special Forces operating behind enemy lines, can identify targets for attack by aircraft flying AI missions. This real-time update of targets is not CAS because friendly troops are not in contact with the enemy but remain covert; this tactic has been called Ground Assisted Precision Strike and was used with great success in the early stages of Operation Enduring Freedom. In fact, bomber aircraft such as B-52s and B-1s, which had hitherto been considered strategic bombers, were able to fly these

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[142] Jacobs et al., *Enhancing Fires and Maneuver Capability Through Greater Air-Ground Joint Interdependence*, 16.

[143] *Ibid*., 16.

[144] Bruce R. Pirnie et al., *Beyond Close Air Support : Forging a New Air-Ground Partnership*, 84-86.

tactical missions with excellent results from their superb on-station time and large payload.[145]

Towards New Doctrine for Canada

Doctrine needs to evolve to embrace the opportunities to capitalize on the firepower that air power brings to the joint fires contribution to the attainment of victory on the battlefield, whether it is a high-intensity conflict or an Hybrid War insurgency. The dividing line between CAS and AI needs to be set as a compromise between the wishes of a ground commander to shape the battlefield for land operations and the desire of an air commander to allow for the attack of enemy forces without the procedural constraints of CAS. The FSCL can be replaced in entirety with Kill Boxes and Keypads to allow for the exploitation of modern situational awareness and navigational tools:

> In many applications, kill boxes and their subdivisions are a more efficient way to delineate battle space than traditional lines, especially during fast-paced, fluid operations like those envisioned under current programs to transform military forces.[146]

It is not a huge leap of faith to see that the way ahead is to view air support to a ground commander beyond the paradigm of CAS under the restrictions of operating inside a defined FSCL. To this end, air power can be viewed as a compliment to ground power as either a supporting or supported partner in joint fires.

There presently exists a golden opportunity for Canadian doctrine to rapidly evolve and establish the framework from which the Canadian Air Force and Army can embark on a new relationship that outlines the modern symbiotic relationship between

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[145] Theisen, *Ground-Aided Precision Strike: Heavy Bomber Activity in Operation Enduring Freedom*, 11.

[146] Bruce R. Pirnie et al., *Beyond Close Air Support : Forging a New Air-Ground Partnership*, 82.

modern air and ground power. *Canadian Forces Aerospace Doctrine* does not address any issues below the strategic level and therefore only gives an overview of the employment of air power in either a supporting or supported role. The closest that Canadian doctrine comes to defining the interaction of air and ground power on the battlefield is in the Canadian Army's *Firepower Doctrine* from 1999 that holds the FSCL, defined by the ground commander, as the demarcation between mission sets for levels of air support.[147] This striking absence of Canadian Forces doctrine, from which TTPs will stem, can be corrected with the inclusion of the advancing concepts of how air power can best contribute to joint fires. This air piece into the joint fires puzzle is not through setting defined lines on the ground such as FSCLs or BCLs but in the flexible adoption of kill boxes and keypads.

Embracing this new method of conducting counterland operations will be a force multiplier for a JFC. The basic concept is very simple; an established grid based on GARS is either defined as a manoeuvre or close combat box. The former is an area that "…contain[s] no friendly ground forces and would allow air to operate without terminal control, but all strikes would be integrated with the planned ground scheme of maneuver."[148] The later boxes would contain friendly troops and any contribution by aircraft to the joint fires would need to be controlled by a FAC.[149] This method of dividing an AO into grids maximizes on the advantages of net enabled operations as a command and control tool. The increased SA from network enabled operations will

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[147] Canada, Department of National Defence, B-GL-300-007/FP-001 *Firepower*, (Ottawa, ON: Department of National Defence, 1999), 44.

[148] Bruce R. Pirnie et al., *Beyond Close Air Support : Forging a New Air-Ground Partnership* 83.

[149] *Ibid*., 83.

allow air and ground commanders to share information on the status of their operations to allow for the synchronization of their efforts towards the common goal of success on the field of conflict.

Another missions set that has matured to the point of inclusion in doctrine is the concept of GARS. This mission, as already mentioned, was used with great success in Operation Enduring Freedom. Small units of Special Forces were deployed into the theatre before the arrival of larger conventional forces. The task of the Special Forces was to identify targets for air attack; the attacking aircraft did not have the particulars of their targets before launching on the mission and received the coordinates of the targets once identified by Special Forces. GARS is a simple tactic to employ because standardized attack profiles can be flown against whatever target is identified. The crucial coordination function of target area deconfliction from friendly troops can be accomplished by covert Special Forces that are sent into the target area by a ground commander for the express purpose of identifying targets according to identified lines of operation in an overall campaign plan. GARS is an excellent way to integrate AI missions into the campaign plan of a JFC without giving up the flexibility of this type of mission.[150]

While AI can be flown into open Kill Boxes with predetermined targets, GARS shows that these same missions can be flown supported by ground troops against targets of opportunity. These can be attacked by aircraft flying in Kill Boxes with a list of priority target types. These missions are akin to the Armed Reconnaissance role that was used with success in the Second World War by the Western Allies in Europe after the

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[150] Theisen, *Ground-Aided Precision Strike: Heavy Bomber Activity in Operation Enduring Freedom*, iii.

Normandy invasion.[151] The danger in these missions is twofold for a JFC. First, the onus for target identification will be on the aircrew to identify valid targets according to the international laws of armed conflict. This is not always easily accomplished, as was witnessed in the cases of civilians being incorrectly identified as Serbian military during some attacks in Operation Allied Force. Second, these missions will need to be synchronized with the overall objectives of the JFC. Aircrew cannot randomly attack targets but need hit targets that will contribute to the attrition of the combat power of an adversary before they come into contact with friendly forces. Therefore, a potential modification of the Armed Reconnaissance role will be to use high endurance UAVs to identify targets for attack once vetted through command and control to ensure target validity; meeting both legal and operational standards for attack.

The above doctrinal changes are well suited to linear operations in high intensity conflicts where air supremacy has been attained. The unimpeded movement of aircraft in counterland operations needs control of the air to allow for the efficient attack of targets; this is especially true for CAS because aircraft will fly in fairly fixed areas as they prosecute attacks controlled by FACs. However, these counterland operations and the recommended doctrinal changes only superficially do not fit well with nonlinear operations. This is true for AI missions when looking at a Hybrid War scenario that has transitioned to stability operations. The initial stages of a Hybrid War may allow for AI missions in open Kill Boxes. However, the more likely use of air power will be in Type 2 CAS using rules of engagement that allow for the attack of vetted targets that are not necessarily attacking friendly troops. For example, streaming video imagery can be used

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[151] Antony Beevor, *D-Day: The Battle for Normandy*, (New York, NY: Viking Books, 2009), 361.

to identify targets that are vetted for attack. CAS procedures are used to control the attacks to ensure that valid targets are hit; attacking invalid targets in stability operations can translate tactical action into strategic consequences that undermine the mission. The same grid system can be used in linear and nonlinear operations. The only difference in these operations will be to what extent Kill Boxes are open for AI attack and how many will be closed, thereby requiring terminal control of air power in joint fires.[152]

It would be naïve to believe that updating Canadian doctrine to replace the FSCL with a GARS based Kill Box system for counterland operations will have a profound impact on American doctrine. The doctrine of the United States needs to be considered because of influence that the US military has on global operations based on the size of their forces. The US will be the first amongst equals in any coalition operations in the future and their *modus operandi* will set the tone for how an operation will be managed and fought. However, Canadian doctrine and TTPs can lean forward to adapt to emerging technologies. With properly equipped and trained forces that are supported by TTPs rooted in emerging doctrine, Canadian expeditionary forces can seamlessly integrate into coalition operations. The opposite is not true because without the proper networked equipment forces cannot be integrated into the command and control structures of the future. These systems are not unique to expeditionary operations but will also be applied for domestic operations; thereby meeting the requirements of the *Canada First Defence Strategy*.

The Canadian military is at a crossroads when examining the doctrine of counterland operations. There is no argument that air power has a key role to play in the

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[152] Jacobs *et al., Enhancing Fires and Maneuver Capability Through Greater Air-Ground Joint Interdependence*, 41-43.

provision of joint fires to a JFC in the conduct of an operation. The Canadian Air Force has an opportunity to lead the way in assessing how air power can be used in the Canadian Forces to deliver kinetic land effects in operations in the future. This assessment can translate to doctrine that will provide guidance for the acquisition of equipment in the future. It has already been identified how decisions will need to be made in the near future on how the Canadian Air Force will replace equipment that is nearing the end of its service life. There is an opportunity to acquire equipment that provides the firepower and ISR requirements of joint fires in the future as the lessons from operations of the last decade are included in the doctrine of tomorrow. The next chapter, will therefore discuss how this opportunity can be translated into equipment that will best place the Canadian Air Force to best deliver air effects in counterland operations.

CHAPTER 5- What Now for Canada?

In examining the questions of how the Canadian Air Forces of the future can best accomplish counterland missions, it is important to focus on the capabilities that are required and not on the specific platforms that would fit these missions. This is important to do because some aircraft are equally able to perform different missions with the same amount of capability. For example, the multi-role CF-188 is able to excel in both AI and CAS missions but the current breed of armed UAVs are not capable of conducting AI missions in addition to CAS. The Canadian Air Force is not unique in considering how to structure its force composition as it embarks on a new round of equipment procurement. All of the major Western Air Forces are absorbing the lessons of Operations Allied Force, Enduring Freedom and Iraqi Freedom to best determine the optimum future force composition to deliver the proper air power effects, at the correct time on the correct target. Fitting future air power into the joint fires equation will ensure that counterland missions are flown that are timely and relevant. Timely in that these effects are provided to friendly troops when required and relevant in that targets struck, especially in the context of AI missions, strike targets that aid in the synchronized attack of enemy targets.

When examining the Canadian Air Force for the 21st Century, it is important to frame the conversation using the *Canada First Defence Strategy (CFDS)* as the cornerstone for the evolving structure of the Canadian Air Force. To this end, it will become evident how aircraft that operate domestically in support of the first mission of *CFDS*, the conduct of daily domestic operations and continental operations, will also have the capability to excel at missions that also meet the 5th and 6th missions of *CFDS*,

to partake in an international deployment for either a prolonged or short deployment. In the three generic platform types that have been discussed earlier, there is a place in the 21st Century Canadian Air Force for a force that includes fighter aircraft, armed UAVs and armed helicopters. A fighter replacement for the CF-188 will be capable of providing counterland kinetic effects across the potential spectrum of operations in the near and far future. An armed UAV is ideally suited to provide persistent ISR in domestic operations but, more importantly in the context of expeditionary operations, be able to provide these same effects coupled with weapons to provide kinetic effects if required. A gap in the counterland capabilities of the contemporary Canadian Air Force is a helicopter that is able to sense-and-shoot.

Breaking down the counterland mission sets, it becomes clear that only a manned fighter is currently able to fulfil the requirements required to fly AI missions in high intensity operations.[153] Undoubtedly in the future there will be autonomous aircraft that are able to cope with the complex scenarios that are inherent in AI missions. The complexity in AI missions stems from the integration of aircraft working together to provide both support to and protection of aircraft that are striking AI targets. An AI scenario will almost always include pre- and post-attack air-to-air refuelling. Flexible target area deconfliction is required in response to adversary IADS activity. No current open source literature alludes to an unmanned system that could be purchased by the Canadian Air Force in the next half decade.[154] This timeline is important because of the

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[153] Thierry Gongora, *Future Combat Air Operations System : Initial Assessment of Roles and Options*, (Ottawa, ON: Department of National Defence, Operational Research Division, 2003), 36.

[154] Carl Doyon, "Replacing the CF-18 Hornet: Unmanned Combat Aerial Vehicle or *Joint Strike Fighter*?" 35.

expected retirement of the CF-188 starting in 2017. In order to introduce into service the replacement for the CF-188, a contract would need to be finalized over the next few years. It therefore follows to reason that the replacement for the CF-188 will be another manned, multi-role fighter that is capable of not only flying NORAD missions but is also capable of flying in deployed, expeditionary operations in either high or low intensity operations.[155]

Both the USAF and RAF have placed growing emphasis on the provision of UAVs in support of ground operations in Iraq and Afghanistan. In 2006, the USAF released its UAV Strategic Vision for the next 25 years that calls for the expansion of the UAV fleet to provide increased ISR support to global operations.[156] From the perspective of counterland operations, it is clear that the USAF has embraced the unique effects that UAVs such as MQ-9 Reapers can provide commanders. The Canadian Air Force has lagged in the fielding of an armed UAV capability. The CU-170 Heron that has replaced the CU-161 Sperwar is a by far more capable ISR platform but it still lacks the ability to deliver kinetic effects in addition to persistent ISR support to commanders at all levels.

The persistent ISR capability of the CU-170 needs to be need bolstered by a platform that provides the same level of ISR with the added benefit of precise weapons to provide Type 2 CAS support for deployed forces. The added capability of a platform with more endurance than a manned fighter that is able to deliver either a LGB or GPS

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[155] *Ibid.,* 39-40.

[156] United States. United States Air Force. *The U.S. Air Force Remotely Piloted Aircraft and Unmanned Aerial Vehicle Strategic Vision,* (Washington, DC: U.S. Air Force, 2005), 22-27.

guided weapon under the terminal attack control of a FAC is a requirement that the Canadian Air Force should enthusiastically pursue.

The rationale for this is simple because of the cost of these platforms. The MQ-9, the most widespread of the armed UAVs, has a unit cost of $10 million USD. The next generation of manned fighter for the Canadian Air Force will cost upwards of $50 million USD for the F-18 E/F Super Hornet to $80 million USD for the F-35 Lightning II. The Canadian Government has indicated in the *Canada First Defence Strategy* that it is planning to purchase 65 next generation fighter aircraft to replace the CF-188.[157] Shying away from the classified war plans of NORAD and Canadian commitments to NATO, a fleet of 65 aircraft does not leave the Canadian Air Force with many aircraft that can be deployed on a major international operation at the same time that the threat levels in Canada require more aircraft dedicated to NORAD missions. This scenario, with an increase in aircraft on NORAD alert, is not unprecedented as it happened in the aftermath of the terrorist attacks of 11 Sep 2001.[158] In order to retain an assured deployment capability for expeditionary operations by fighter aircraft, the Canadian Air Force will require more than 65 aircraft to replace the CF-188; regardless of the capability of the airframe it comes down to the number of aircraft committed to NORAD which will dictate the number of internationally deployable aircraft.

The desire to have more manned fighters to fly in international operations also needs to be weighed against the likelihood of platforms being deployed on kinetic expeditionary operations. The governments of Prime Ministers Jean Chrétien, Paul

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[157] "Canada First Defence Strategy," http://www.forces.gc.ca/site/focus/first-premier/missions-eng.asp accessed 14 Jan 2010.

[158] Joseph Jockel, *Canada in NORAD, 1957-2007: A History*, 167

Martin and Stephen Harper have all sent Canadian forces into harm's way but the emerging face of war is not one of high intensity conflict. To draw conclusions about the nature of conflict for the foreseeable future based on the recent conflicts of the major Western powers is fraught with danger; the maxim of preparing to fight the last war comes to mind. But the reality facing the Canadian Air Force is that there is only so much money available for the department as a whole for capital projects such as the Next Generation Fighter Aircraft. While the Canadian Governments of the 21st Century to date have all committed forces to the Global War on Terror, the likelihood that Canadian aircraft will be sent into a conflict that will require them to fly complex AI missions into foreign land with a robust IADS, as was done in Serbia, is not great. The more likely scenario that Canadian troops will face in the future will be more stability operations in failed or failing states such as in Afghanistan. The CAS support that troops in these theatres of operations will require can be met by armed UAVs that also provide the persistent ISR that is vital to ground commanders.

This is not to say that manned fighters will not be sent into a theatre of operations to fly CAS missions. An interesting scenario would involve manned fighters being guided to their targets based on ISR intelligence gained from a UAV. USAF UAVs can use their laser designators to guide LGBs to their targets; the fighter release the weapons and the UAV guides the weapon to the target.[159] The multi-role fighter that replaces the CF-188 will have the capability to fly AI and CAS missions but the greater return on investment for the Canadian Air Force to provide CAS support to deployed operations

[159] For more on the discussion of the role of armed UAVs in the future, see David Hume, *Integration of Weaponized Unmanned Aircraft into the Air-to-Ground System*, (Maxwell AFB, AL: Air University Press, 2007).

will come from an armed UAV to supplement the CU-170 Herons that are providing critical support to the Canadian Battlegroup in Afghanistan. The only option that will remain for the Canadian Air Force to conduct an offensive air campaign into opposed airspace will come from the fighter force; with either CF-188s or their replacement.

The remaining capability that needs to be met by the Canadian Air Force of the future is the fielding of an armed helicopter that is able to sense and engage targets. Experience from Afghanistan and Iraq has shown that helicopters are vulnerable to ground fire, as witnessed in the damage sustained by AH-64s in the early stages of Operation Anaconda and the failed deep strike attack in Iraq on 24 March 2003. Armed helicopters have a unique niche to fill on the contemporary and future battlespace of escort and screening missions. The Canadian Air Force has recently signed an order for CH-47D and CH-47F Chinooks. These large helicopters have been and will continue to be used to transport troops and supplies in an AO to decrease the reliance on Combat Logistics Patrols (CLPs). A decrease in the number of CLPs required will decrease the exposure of friendly troops to improvised explosive devices (IEDs) that have become among the weapons of choice of insurgents in Hybrid Warfare. Therefore, when Canadian troops deploy in the future the force structure will invariably include a CH-47 component. It has been recognized that CH-47s flying in the AO require an escort because of the identification of CH-47s as high payoff targets for insurgents.[160] The CH-146s that are currently deployed to Afghanistan are flying escort and light utility missions as well as the platform allows but the Griffons are limited in speed to react to threats and the amount of firepower that they can bring to bear on a target.

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[160] Tom Kupecz, "Escort for Canada's *Chinook* Helicopter," *Canadian Military Journal* 8, no 3 (Autumn 2007), 91-92.

A replacement is for the CH-146 is again dependent on funding like the replacement for the CF-188. The Canadian Air Force still has a utility requirement that a Griffon replacement will need to fill, but this role should also include an attack role as well. An attack helicopter to fly escort missions for CH-47s does not require a dedicated airframe such as the AH-1Z or AH-64 but requires a platform armed with guided weapons able to deliver the capability to cruise at a speed in excess of the CH-47 with an additional utility capability. This may not be possible with the current specialized airframes that are in production by major Western helicopter companies but the requirement remains for a replacement for the Griffon to be capable of escorting CH-47s in operations.

Escort missions on their own do not constitute a counterland mission according to accepted doctrine. However, this is an air-to-ground kinetic capability that the Canadian Air Force should strive to attain. Another derivative of this mission is the screening of ground manoeuvre that an armed helicopter can do to great effect. The screening missions that AH-64s flew in the advance to Baghdad are testament to the flexibility of armed helicopters when they are able to operate in concert with ground operations.[161] The long endurance and ability to rapidly re-arm helicopters from forward locations make these capable force multipliers for joint fires. A balanced force structure for a future helicopter force should include a platform that is able to provide firepower support in

[161] Michael Gordon and Bernard E. Trainor, *Cobra II: The Inside Story of the Invasion and Occupation of Iraq*, 352.

response to friendly troops under attack or in response to ground fire on CH-47s that are moving troops and supplies within a future AO.[162]

The deployment of Canadian troops in the Global War on Terror has provided a new focus on counterland missions within the Canadian Air Force. The experience from 1999's Operation Allied Force in Serbia showed the value of a fighter force that is able to successfully conduct AI missions into opposed airspace. The collective Western experience from Operations Enduring Freedom and Iraqi Freedom have provided signposts for the future of counterland operations in future conflicts that span from high intensity conflicts to counterinsurgency missions, sometimes within the same AO. The replacement for the CF-188 will be capable of flying opposed and unopposed AI and CAS missions concurrently. The requirement to provide persistent ISR capability that can be provided by an armed UAV to supplement manned fighters has also been identified. In any future AO, the Canadian Air Force will be counted on to provide helicopter lift which will require escort that can be best provided by an armed helicopter that can sense and engage targets with guided weapons. For the warfighters in the Canadian Air Force, the future is bright because of the requirement to provide precision air power in joint fires to either provide support to or be supported by ground forces. A force structure for numbers and specific airframe types has yet to be determined. What is without debate is that the Canadian Air Force of the future must be equipped to provide the precise joint fires that operations over the last decade have shown.

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[162] Tom Kupecz, "Escort for Canada's *Chinook* Helicopter," 95.

CHAPTER 6 - CONCLUSION

The evolution of Canadian kinetic air power has been disjointed since the end of the Second World War because of the few occasions that Canadian aircraft have been deployed overseas in conflict to attack an adversary. CF-188s flew in 1991's Operation Desert Storm and 1999's Operation Allied Force in both Defensive Counter Air and AI roles. These two deployments are the only occasions in the 65 years since the end of the Second World War that Canadian aircraft have employed weapons offensively against targets. CH-146s have been deployed to Bosnia and recently Afghanistan armed with self-defence weapons but they have not been employed to offensively strike targets in support of land operations. However, the Canadian Air Force of the future is on the cusp of being able to replace retiring equipment with platforms that are ideally suited to provide precision kinetic support to counterland operations.

The *Canada First Defence Strategy* has identified the Canadian Government's intention to be active internationally to protect Canadian sovereignty and interests both at home and abroad. Specifically the commitment to conduct major international operations for an extended time or react to specific world events with shorter operational deployments highlights the requirement for the Canadian Air Force to arm itself with equipment and doctrine that exploits the technological advances in air power to provide an air contribution to joint fires. This ability to fly counterland missions in either a supporting or supported role is a departure from the hitherto traditional role of the branches of the Canadian Air Force equipped with aircraft capable of flying counterland operations.

After the Second World War, the main effort of the Canadian fighter force was towards providing an AI or strike capability in Europe flying in support of NATO. The aircraft that were employed in Central Europe were not well suited to providing synchronized support to land operations because of their manoeuvrability, range or armament. This changed with the introduction of the CF-188 Hornet and the gradual inclusion of CAS as a capability that the fighter force delivered.

All of this was happening against the backdrop of a culture within Western Air Forces that asserted its collective independence from land forces. This assertion of independence was born of the belief that air power in its own right held the keys to success in modern conflict through the ability to strike at the core of an adversary's fighting capability. The bombing campaign that served as the opening stages of Operation Desert Storm and NATO's air campaign against Serbia in Operation Allied Force highlighted the technological advances that had occurred in guided weapons that allowed for the more efficient striking of identified targets crucial to an adversary's war effort; spanning from command and control nodes to transportation infrastructure that facilitated the supply of fielded forces. Culturally the Canadian fighter force grew apart from the Canadian Army after the success of these two operations; Canadian participation in AI missions in these two conflicts were seen as validation of the promotion of the emphasis of AI over CAS as Canada's counterland capability.

This culture of Air Force kinetic operations separate from the synchronization of missions to support joint fires has been a contributing factor to the lack of CF-188 deployment to Afghanistan in support of Canada's contribution to the GWOT. This fact has led to a reassessment of the relevance of Canadian Air Force support to counterland

operations. However, the experience of the Canadian Army in Afghanistan has shown the relevance of air power in joint fires when combined with the overall lessons learned from Operations Enduring Freedom and Iraqi Freedom. Additionally, the trend to persistent air power capable of providing precise kinetic support to joint fires gives more credence for the call for Canada's Air Force to evolve doctrinally with new equipment that is able to provide timely kinetic air power in future deployments by Canadian troops.

The Canadian Air Force has an opportunity to capitalize on the lessons and trends from the conflicts of the last ten years to diversify the number of deployable platforms available to provide counterland support to deployed operations. These same deployable platforms, such as an armed UAV and the manned fighter replacement for the CF-188, can also fly in operations in North America to defend Canadian sovereignty. A multi-role helicopter that is able to provide a transport capability while having the modular ability to include a sense and shoot capability is sorely needed in the future Canadian Air Force to balance the helicopter fleet that is deployable for global operations. The evolution of counterland doctrine to embrace the advances in modern technology in the Canadian Air Force is required to set the framework from which the requirements for these modern, multi-role aircraft can be acquired and deployed in support of future Canadian expeditionary operations.

The intent of this paper has been to discuss the evolution of the ability of the Canadian Air Force to provide kinetic support to land operations. This capability is rapidly evolving to embrace the technological advances witnessed since the end of the Cold War. Future weapons systems need to be purchased to maximize the capability of the Canadian Air Force to provide timely and accurate kinetic support to joint fires. The

future of kinetic air power in the Canadian Air Force cannot merely be viewed as providing aerial firepower to land operations. Modern conflict requires the synchronized operations of all services in order to collectively succeed on the battlefield. The Canadian Air Force is on the cusp of capitalizing on the shared realization of the power of synchronized efforts in counterland operations to best prepare the force structure for the challenges and demands of future battlespaces. The kinetic capability of the Canadian Air Force needs to be examined with a view of deploying a balanced force of fixed-wing, rotary-wing and unmanned vehicles capable of delivering accurate firepower in both preplanned and reactive counterland missions. This force structure will provide the greatest impact to joint fires from the Canadian Air Force.

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