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CANADIAN NORAD REGION – POSTURED FOR THE TERRORIST THREAT?

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ACC	Air Component Command
ACOP	Aerospace Control Operator
AD	Air Defence
AEC	Aerospace Control
ALCM	Air Launched Cruise Missile
ANR	Alaskan NORAD Region
AOC	Air Operations Centre
ASA	Air Sovereignty Alert
ATC	Air Traffic Control
AWACS	Airborne Warning and Control System
BCS-F	Battle Command System (Fixed)
C2	Command and Control
CACO	Civil Aviation Contingency Operations
CADS	Canadian Air Defence Sector
CANR	Canadian NORAD Region
CANUS	Canada/United States
CF	Canadian Forces
CMOC	Cheyenne Mountain Operations Centre
CONR	Continental NORAD Region
CONUS	Continental United States
COP	Common Operational Picture
CSIS	Canadian Security Intelligence Service
DND	Department of National Defence
DPS	Defence Policy Statement
FAA	Federal Aviation Administration
FOI	Flight Of Interest
GUARD	Ground-based Urban Air Radar Defence
GOC	Government Operations Centre
HACMD	Homeland Air and Cruise Missile Defence
HQ	Headquarters
ICBM	Inter-Continental Ballistic Missiles
IPS	International Policy Statement
JFACC	Joint Force Air Component Command
JTF	Joint Task Force
JSS	Joint Surveillance System
MLC	Military Liaison Controller
NAVCAN	NavCanada
NEADS	Northeast Air Defense Sector
NORAD	North American Aerospace Defence
NORTHCOM	Northern Command
NWS	North Warning System
ONE	Operation NOBLE EAGLE
OPCOM	Operational Command
OPCON	Operational Control
PSEPC	Public Safety and Emergency Preparedness Canada

PSR	Primary Surveillance Radar
SCTF	Standing Contingency Task Force
SEADS	South Eastern Air Defense Sector
SLCM	Sea Launched Cruise Missile
SSR	Secondary Surveillance Radar
TACON	Tactical Control
TADIL	Tactical Data Information Link
TC	Transport Canada
TOI	Track of Interest
TRSD	Terminal Radar Situation Display
TSA	Transportation Security Administration
UAV	Uninhabited / Unmanned Aerial Vehicle
US	United States
USAF	United States Air Force
VP	Vital Point
WADS	Western Air Defense Sector
WMD	Weapon(s) of Mass Destruction

ABSTRACT

This paper evaluates CANR against the tenets of air power to conclude that CANR is not postured to respond to the airborne terrorist threat, and that Canada is not prepared for the consequences. In the post 9/11 world, aircraft as weapons of mass destruction and terror are a new and stark reality. As partner in the bi-national North American Aerospace Defence (NORAD) Agreement, Canada stands ready with air sovereignty alert aircraft to intercept, divert and if necessary, prosecute airborne objects that threaten Canada or the United States. However, the new threat environment, inadequate surveillance and communications coverage and aging and scarce intercept assets leave Canada vulnerable to airborne objects intended as weapons of mass destruction. As well, disjointed coordination between CANR and ground response agencies further affect the Canadian NORAD Region (CANR) mission and the ability of Canadian Government and other agencies to respond to a terror attack in accordance with the national objectives defined in Canada's International Policy Statement and National Security Policy. This paper examines the threat environment and counter-threat capabilities from a Canadian perspective, Canada's response mechanisms including political, military and from other government and civil agencies, and the emerging role of Canada Command. Included is comment on the political impact of a successful prosecution by CANR, both peaceful and violent, versus failure to prosecute is commented on. CANR is then evaluated using the tenets of air power to assess its posture to respond to the airborne terrorist threat.

INTRODUCTION

Consider this scenario: a commercial airliner inbound from London's Heathrow airport, across the North Atlantic Route System, through Canada and en route to a destination south of the 49th parallel. Intelligence reports a "no-fly list"[1] person on board and Canada is informed the aircraft will not be permitted into American airspace. Directions through civil air traffic control for the aircraft to return to destination go unheeded by the aircraft. CF-18 Hornet aircraft are scrambled to intercept and the aircraft is requested to divert to a destination in Canada. Communications with the aircraft suddenly stop; the aircraft deviates from its flight-planned route and is headed towards a major Canadian population centre. The aircraft is unresponsive to air traffic control or fighter direction and is declared hostile by the Government of Canada. As the aircraft approaches the city it begins a steep descent with clear hostile intention: it has become a weapon of mass destruction (WMD). In accordance with national security procedures, the Government authorizes destruction of the "weapon." There are 177 passengers and ten crewmembers on board.

The Canadian North American Aerospace Defence (NORAD) Region (CANR) practices this scenario and others like it on at least a monthly basis, and not always with the same results. There are many variations, such as: not being able to intercept the aircraft before it crashes in a 9/11-type scenario;[2] not being able to affect an intercept due to radar and communications shortfalls; or not being able to obtain engagement authority

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[1] For a description of "no-fly person" and "no-fly list" see page 47-48: Chapter 7 "Responding to the Threat" subsection "Intelligence Triggers."

[2] The 11 September 2001 terrorist attacks on the World Trade Center and the Pentagon on are also popularly referred to as 9/11. In this paper, *11 September 2001* and *9/11* are used interchangeably.

from the Government of Canada. All of these raise disturbing questions about the posture and capabilities of CANR to respond to the airborne terrorist threat.

Since the end of the Cold War, Canada has experienced a dramatic shift in strategic and military threats. The terror attacks of 11 September 2001 have identified that emerging threats of the new millennium, threats led by rogue nations or terror organizations, are capable of inflicting substantial economic and physical damage. In short, "security no longer starts at Canada's borders."[3] Traditionally vigilant for Cold War threats from abroad, the organization and employment of CANR is crucial to the strategic, operational and tactical levels of Canadian security, but is CANR postured to respond to today's terrorist threat?

After a "decades-long legacy of neglect"[4], the shortcomings of the Canadian Forces (CF), including Air Force assets, systems and infrastructure are well known. The events of 11 September 2001 have added another level of complexity to the debate. In an era of escalating threats that are starting to hit closer to home, "Canada's Armed Forces are likely to be more important to the well-being of Canadians over the next few decades than they have been at any time since World War II."[5] But are the forces assigned to protect Canada postured to answer the call with the level of effectiveness expected by Canada and Canadians?

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[3] John Barrett, "Arms Control and Canada's Security Policy," *International Journal*, vol. 42, no. 4 (Autumn, 1987): 731.

[4] *Report of the Standing Senate Committee on National Security and Defence*, "Wounded: Canada's Disappearing Options for Defending the Nation at Home and Abroad, Executive Summary," The Honourable Colin Kenny, Chair. (Ottawa: Parliamentary Publications Directorate, September 2005), 1.

[5] *Ibid*., 2.

Canada as a sovereign state has a duty and responsibility, not only to its citizens, but also to the United States (US), its closest ally and partner, to play a meaningful role in the defence of North America against the emerging terrorist threat. Canadians wonder what role their military can or should play in counter-terrorism. Further, if Canada neglects this role, what impact will it have on Canada-US relations, and what impact will it have in the aftermath of another terror attack against North America?

In determining if CANR is postured to meet the terrorist threat, this paper defines "posture" as the state or condition at a given time especially with respect to capability in particular circumstances; in other words, to assume a posture, especially, to strike a pose for effect.[6] Therefore, the question to be answered is also whether CANR's posture would be effective against the airborne terrorist threat. Accordingly, this paper contends that for some circumstances that fall directly under the responsibility of the Canadian NORAD Region, CANR is not postured to meet a terrorist threat that is determined to use an airborne weapon of mass destruction against Canada.

After a brief background of CANR and its evolving role since 9/11, a closer examination of the airborne threat to Canadian national security is warranted to assess exactly what that threat is and how relevant CANR is in response to that threat. Secondly, the current defence systems in support of the CANR mission will be analyzed, to include a critical assessment of perceived and actual capabilities of the surveillance and communications systems and intercept assets. Thirdly, the response mechanisms that link CANR, the Government of Canada and other government departments in ensuring continuing peace and security as delineated in Canada's International Policy Statement

[6] Merriam-Webster OnLine, "Merriam-Webster OnLine Dictionary," http://www.m-w.com/cgi-bin/dictionary/; Internet; accessed 04 February 2006.

(IPS) and National Security Policy (NSP) are examined in consideration of the risks and impact of action and inaction against an airborne terrorist threat. Finally, this paper uses the tenets of air power in analysis to conclude that CANR is not postured to respond to the airborne terrorist threat, and that Canada is not prepared for the consequences.

BACKGROUND

NORAD is a bi-national military organization formally established in 1957 through agreement by Canada and the United States to monitor and defend North American airspace. Using data from satellites and ground base radar, NORAD monitors, validates and warns of attack against North America by aircraft, missiles or space vehicles. NORAD also provides surveillance and control of the airspace of Canada and the United States. This common defence of the North American continent traces its history back to 1940 when Canadian Prime Minister Mackenzie King and American President Franklin Roosevelt met to discuss the war in Europe and mutual defence concerns.[7] In September 1957, the two nations agreed to create the "North American Air Defense Command" headquartered at Peterson Air Force Base in Colorado Springs, Colorado, as a bi-national command, centralizing operational control of continental air defences against the threat of Soviet bombers. On 12 May 1958, the agreement between the Canadian and US governments that established NORAD was formalized. The agreement included eleven principles governing the organization and operation of NORAD and called for a renewal of the agreement in ten years.[8]

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[7] North American Aerospace Defense, "North American Aerospace Defense," http://www.norad.mil/index.cfm?fuseaction=home.news_fact; Internet; accessed 21 February 06.

[8] *Ibid*.

The first renewal of the agreement came in March 1968. The NORAD Agreement has been reviewed, revised, renewed or extended several times since then: May 1973; May 1975; May 1980; March 1981 (when the name was changed to "North American Aerospace Defense Command"); March 1986; April 1991; March 1996 and June 2000.[9] The latest renewal is due for May 2006.[10] The March 1996 renewal redefined NORAD's missions as aerospace warning and aerospace control for North America. This edition of the agreement included a consultative mechanism for issues concerning aerospace defence cooperation and a provision for the review and management of environmental practices related to NORAD operations. Post 9/11, NORAD introduced their "Vision 2020" to provide comprehensive, integrated aerospace defence of North America.

NORAD command and control is exercised through the Cheyenne Mountain Operations Center (CMOC) in Colorado. Cheyenne Mountain serves as a central collection and coordination facility for a worldwide system of sensors designed to provide NORAD with an accurate picture of any aerospace threat. NORAD encompasses three unique regions: CANR, Alaskan NORAD Region (ANR) and Continental NORAD Region (CONR), each of which has a similar structure. The Alaskan and Continental NORAD Regions both have American Commanders and Canadian Deputy Commanders.

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[9] Details of the August 2004 amendment to the NORAD Agreement are available from http://www.fac-aec.gc.ca/department/note_0095-en.asp; with an overview of the NORAD Agreement at http://www.norad.mil/about_us/NORAD_agreement.htm.

[10] Statement of Admiral Timothy J. Keating, USN, Commander United States Northern Command and North American Aerospace Defense Command before the Senate Armed Services Committee, 14 March 2006; available from www.senate.gov/~armed_services/statemnt/2006/March/Keating%2003-14-06.pdf; Internet; accessed 16 April 2006. "The NORAD Agreement will expire in May of this year. In November 2005, the US Department of State and Foreign Affairs Canada negotiated a draft renewal which [sic] may add a maritime warning mission, extends the Agreement indefinitely, and permits either nation to request a review of the agreement at any time. As Canada Command, tasked with homeland defense missions and responsibilities in Canada, becomes fully operational, a review of the roles and missions amount USNOTHCOM, Canada Command and NORAD will be warranted."

CANR has a Canadian Commander and an American Deputy Commander. NORAD's surveillance and control responsibility is divided among the three regions to essentially cover all of North America and its approaches.[11]

With a motto of "deter, detect and defeat,"[12] the NORAD strategy outlined in *North American Aerospace Defense Command: Strategic Vision 2020* is twofold: aerospace warning and aerospace control. The aerospace *warning* mission is stated as "the monitoring of man-made objects in space and the detection, validation and warning of attack against North America, whether by aircraft, missiles or space vehicles." The aerospace *control* mission is stated as "providing surveillance and control of the airspace of Canada and the United States."[13] Today's NORAD mission succinctly summarizes the vision of providing comprehensive, integrated aerospace defence for North America. These missions have evolved over the years, denoting the strength of the NORAD Agreement and a testimony to the close cooperation between Canada and the United States. The on-going adaptation of NORAD's mission and capabilities to meet the challenges posed by ever-changing threats has renewed importance since the horrific terror attacks of 11 September 2001:

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[11] CANR headquarters is in Winnipeg, Manitoba; CONR is headquartered at Tyndall Air Force Base, Florida; and ANR is headquartered at Elmendorf Air Force Base, Alaska.

[12] The motto advertised on the NORAD website recently changed to replace "defend" with "defeat," more accurately reflecting the vision and mission of NORAD in the post 9-11 world.

[13] United States, North American Aerospace Defense Headquarters, *North American Aerospace Defense Command – Strategic Vision 2020*, (Colorado: HQ NORAD Directorate of Plans, 2004), 7.

> From its inception in 1958 [sic], NORAD has evolved to meet a wide variety of security challenges ranging from manned bombers, intercontinental and sea-launched ballistic missiles, to more recently, cruise missiles. NORAD's defense of Canada and the United States is as important in the post-cold war era as it was 45 years ago. The differences are the uncertain nature of the threat and the response time allowed. We must be ready to respond to a wider array of threats in a shorter amount of time than ever before.[14]

Prior to 11 September 2001, NORAD was a word that was associated predominately with the Cold War. The eyes and ears of NORAD were focused almost exclusively on aerospace threats coming toward the Canadian and American borders from sources far from the shores of North America. Until that morning, NORAD's focus was, not terrorism from within our domestic airspace. NORAD changed that day. The Cold War image was shed. NORADs focus increased to include domestic airspace, looking inwards as well as outwards. Today, NORAD uses ground-based radar, airborne radar, satellites, fighter aircraft, extensive command structures and intelligence capabilities to enforce control of the skies over the US and Canada, in accordance with the "core, non-negotiable responsibilities": deterrence, detection and defeat of aerospace threats to North America; providing timely, accurate integrated tactical warning and attack assessment; and performing Operation Noble Eagle missions.[15] The events of 9/11 provide evidence of NORAD's continued relevance to the defence of North America.

CANR is an integral part of this defence, tasked with the surveillance and monitoring of ten million square kilometres of airspace and 240,000 kilometres of

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[14] General Ralph E. Eberhart, as quoted in *Ibid*., 10.

[15] North American Aerospace Defense, "North American Aerospace Defense," http://www.norad.mil/index.cfm?fuseaction=home.news_fact; Internet; accessed 21 February 06. Operation NOBLE EAGLE will be further defined and discussed in the next Chapter. Operation NOBLE EAGLE, Noble Eagle, and ONE are used interchangeably in this paper.

coastline.[16] Specifically, the mission of CANR is to continuously provide warning (detection, validation, and warning) of an aerospace attack on North America and maintain aerospace control in Canada. To this end, CANR will use air sovereignty alert (ASA) and appropriate aerospace defence measures in response to hostile actions against North America in support of the Commander NORAD or unilateral Canadian national objectives.[17]

CANR Headquarters, located in Winnipeg, Manitoba, serves as the central point of command and control for Canada's operational air force and oversees the monitoring of Canada's airspace in support of NORAD commitments. The Air Operations Centre (AOC) within the headquarters directs and monitors day-to-day air force operations. It contains a wide range of communications and data analysis equipment, and is manned 24 hours a day, 365 days a year. CANR is also the Air Component Command for Canadian Air Force assets, and coordinates apportionment and use of these assets for national security through Canada Command to concurrently support the Regional Joint Task Forces and the Standing Contingency Task Force.[18]

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[16] Canada's Air Force, "North America." http://www.airforce.forces.gc.ca/index_e.asp; Internet; accessed 25 February 2006.

[17] Much of the CANR mission, intent and employment details throughout this paper are abridged or paraphrased from unclassified portions of the 1 Canadian Air Division / Canadian NORAD Region SUPLAN 3310-02 (October 2004), courtesy of 1 Canadian Air Division Aerospace Readiness. The SUPLAN 3310-02 is classified "SECRET CANUS" and was thus not available in researching this paper.

[18] The *Standing Contingency Task Force* (SCTF) mission is to respond rapidly to emerging crises. This high-readiness contingency task force will be a fully integrated combat unit comprised of existing designated maritime, land, air and special operations elements, organized under a single command structure. It will be postured and equipped to deploy within ten days' notice, and provide an initial CF presence to work with security partners, provide strategic intelligence and warning and facilitate follow flow of forces, if necessary. General Rick Hiller, "Setting Our Course: The Way Ahead for Our Canadian Forces," available from http://www.cds.forces.gc.ca/00native/pdf/cds-vision_e.pdf; Internet; accessed 15 June 2005.

Commander CANR is accountable to the Commander NORAD to exercise operational control over forces assigned or made available for air defence of the region; and provide advice to Commander NORAD on matters pertaining to the Canadian Forces. In the post 9/11 world, this has become an even greater task as NORAD, and by extension CANR, now also looks inward to defend national security and to deter, detect, and defeat air-breathing threats of domestic origin. On any given day, extraordinary security measures may be required to execute this mission and counteract the imminent threat of terrorism that has become far more cunning and resourceful over the last decade. Is CANR postured to deal with these circumstances?

OPERATION NOBLE EAGLE

Immediately following the terrorist attacks on the World Trade Centre towers and the Pentagon, all NORAD forces went into a heightened state of alert; one that quickly became Operation Noble Eagle (ONE), and continues today as NORAD's internal air defence mission. Specifically for CANR, Operation Noble Eagle is the defence against asymmetric air threats aimed at Canadian metropolitan centres, nuclear facilities, critical infrastructure and other vital points.[19] The ONE response uses a series of alert fighters, tankers and airborne early warning aircraft cued by interagency warning and networked surveillance radars. CANR invoked new standard operating procedures to defeat derelict airborne objects, renegade/rogue aircraft or airborne objects or hijacked aircraft, and to deter these aerial threats, external or domestic.

[19] "Vital points" correspond to Canadian metropolitan centres, nuclear facilities and critical infrastructure. The list of specific Canadian VPs is classified and cannot be provided in this paper.

As a result of 9/11, NORAD and CANR maintain a heightened response posture, which directs the alert force status during air sovereignty and air defence alert operations. Commander CANR has the flexibility to assign a different response posture in the region, based on intelligence indicators or threat assessment. In situations where few details are available, CANR will react to an air event in Canadian airspace by ordering CF-18 air sovereignty alert aircraft to battle stations or runway alert response posture, and scrambling the aircraft such that they can intercept the threat before it endangers a metropolitan area or vital point.[20] ONE response mechanisms will be discussed in greater detail in Chapter 7 of this paper. Suffice to say at this point that CANR is a vital link in the chain of defence, on guard to protect Canada and Canadians from aerial terrorism or threats. This paper will now turn to an examination of exactly what that threat is.

THE TERRORIST THREAT – A CLOSER LOOK

In the NORAD context, "the threat environment has expanded from a strategic, nuclear, symmetrical threat from bombers, ICBMs (intercontinental ballistic missiles), and air-or-sea-launched cruise missiles, to a continuing symmetrical threat *in addition to* an emergent asymmetric threat, focussed across all domains, borders and agencies."[21] Likewise, CANR faces a spectrum of air breathing threats from overt military attack to rogue missile attack to aerial terrorism. CANR as yet does not have a ballistic missile

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[20] 1 Canadian Air Division, *Ibid*. There are different levels of NORAD response postures (RP) for alert aircraft. "Battle Stations" is generally defined as to pilot in the cockpit, ready for engine start. "Runway Alert" is defined as the aircraft engine running and taxi complete if practicable, minimizing time to takeoff.

[21] Lieutenant-General Rick Findley and Lieutenant General Joe Inge, "North American Defence and Security in the Aftermath of 9/11," *Canadian Military Journal*, vol. 6, no. 1 (Spring 2005): 11. CANRs threat analysis looks forward ten years.

defence role, thus, ballistic missile threats and defence are outside the scope of this paper. Discussion is therefore limited to air breathing threats in the context of terrorism and rogue nations.

Russia is currently the only entity possessing the capability to launch a massive strategic attack against North America. An attack by Russia is considered highly unlikely; however, it could result from regional conflict or from miscalculation during a period of increased tension. Both of these scenarios may be triggered and/or fomented by terrorist activities and intent.[22] Indeed, Russian strategic assets pose a considerable air-breathing capability against North America. Most worrisome, though is the Russian black market sale of weapons technology to both state and non-state actors, contributing to proliferation, increasing the vulnerability of states and uncertainty of attack by these means.

"(North) Korea is (also) a world-class proliferator, having sold weapons, notably missiles and related technology, to Pakistan and an array of regimes in the Middle East."[23] Likewise, Iran has a robust missile development program, which is receiving assistance from Russia, China, and North Korea. Either or both may be a direct threat within the next ten years, but is currently unlikely.[24] That said, once this external threat becomes viable, whether intended toward Canada or not, Canadian airspace and the

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[22] Canada, Department of National Defence, *Strategic Assessment 2004,* (Ottawa: Directorate of Strategic Analysis Policy Planning Division Policy Group, 2004), 65. For more information on Jihadism and Jihadist tactics, see pages 29-34 of *Strategic Assessment 2004*.

[23] *Ibid*., 73-74. The only potential challenger to US pre-eminence in Asia, and indeed the world, is China. China has a limited, yet increasing, number of strategic missiles that could strike CANR, though are likely not postured against on alert or against CANUS (Canada/US).

[24] Canada, Canadian Security Intelligence Service, *Perspectives Report No. 2000/09: Ballistic Missile Proliferation,* (23 March 2001), available from http://www.csis-scrs.gc.ca/en/publications/perspectives/2000009.asp?print_view=1; Internet; accessed 27 February 2006.

territory underlying it are, by nature of geographic proximity to the US, threatened by the prospect of these missiles. Further, similar to the situation in Russia, weapons proliferation and sale to non-state actors poses great concern.

According to the US State Department publication *Patterns of Global Terrorism 2003,* Iran 'remained the most active state sponsor of terrorism in 2003."[25] Their continuing support to national liberation movements and their purported links to al-Qaeda keep Iran in the sphere of state-sponsors of terrorism, and in turn make their acquisition of weapons technology a disturbing cause for concern. In the age of trans-national terrorism, this potential for weapons proliferation is significant. Non-state actors now have the destructive capacity that once belonged only to nation states, and the support networks to deliver that destruction globally. Indeed, more than 20 countries now seek or control short and/or medium range missiles, and that number are growing.[26]

As alluded to above, cruise missiles are not just a threat from nation states. While unclear how rapidly cruise missiles will spread from state to non-state actors, and to date, no terrorist group has used a cruise missile, the lessons of 9/11 show it is certainly conceivable that they may obtain these means. The technology is widely available as are the components. Much of what goes into a cruise missile such as Global Positioning System (GPS) guidance, digital flight management systems, and composite materials –

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[25] Canada, DND, *Strategic Assessment*… 37. The US commission reporting on the 9/11 attacks revived questions of Iran's links to al-Qaeda, noting that several of the 9/11 hijackers had connections to Iran. Iran was also implicated in the 1996 Khobar Towers bombing, further linking al-Qaeda to Tehran through its Saudi Hezbollah proxy.

[26] Canada's Air Force, "The Threat," http://www.airforce.forces.gc.ca/athomedocs/athome_1_1_e.asp; Internet; accessed 25 February 2006.

are dual-use or completely civilian.[27] Indeed, 9/11 proved that commercial means could wreak havoc in North America.

Cruise missiles can be launched from aircraft, surface ships, submarines or ground units well beyond a countries detection capability, or from within a countries sovereign territory or air space giving no prior warning. Due to their range, accuracy and small cross section, cruise missiles are hard to detect and almost impossible to destroy. A terrorist group or rogue nation could place a shorter-range missile on a ship or barge off of the coastline and outside territorial waters, and still wreak havoc, since with a weapon of mass destruction, accuracy is not essential. Since these new generations of weapons may be in the hands of those who could threaten Canada, CANR is more relevant today as it was 40 years ago.

Weapons of mass destruction (WMD) of any kind in the hands of terrorists are also much harder to deter than those in the hands of state proliferators. As Major-General Doug Dempster, then Director General of Strategic Planning at the Canadian Department of National Defence articulated in 2004: "The genie is effectively out of the bottle."[28] In 2002, the Center for Defence Information reported that more than 80,000 cruises missiles comprised of 75 different systems were deployed in at least 81 countries, and roughly 90 percent of those were short-range systems, having a range of 100 kilometres or less.[29]

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[27] David Isenberg, "The Real Missile Threat: Cruise Not Ballistic," *Center for Defense Information* (8 July 2002) [journal on-line]; available from http://www.cdi.org/terrorism/cruise-pr.cfm; Internet; accessed 22 February 2006, 1.

[28] MGen Doug Dempster, "The CF in the Domestic and International Strategic Environment," in *Canadian Strategic Forecast 2004: The 'New Security Environment': Is The Canadian Military Up to the Challenge?* ed. David Rudd and David S. McDonough, 43-55 (Toronto: Canadian Institute of Strategic Studies, 2004): 47.

[29] Isenberg, "The Real Missile Threat…," 2. Cruise missiles are generally more accurate by a factor of at least ten, and less costly by at least half.

Additionally, with growing knowledge in biotechnology, chemical-technology and nuclear-technology, it is likely that proliferation of WMD will become an even more disturbing issue in the future. With greater accuracy, less cost and, better aerodynamic stability, they are substantially more effective in delivering chemical or biological payloads. Delivery systems are both "cheap to build or even to buy as off-the-shelf items from a growing list of arms manufacturers. Any one can be equipped with a conventional explosive, or a chemical, biological or even a nuclear warhead, and a GPS-based guidance system."[30] Again, the 9/11 scenario harshly demonstrated that hi-tech platforms are not required to deliver WMD.

For CANR, it is also "not a traditional military world."[31] Renegade aircraft threats, through commercial airliners or business aircraft are likely to remain both a target and a platform of choice for terrorist attacks. Terrorists are also likely to pursue other possible forms of aerial attack, such as small private aircraft or unmanned/uninhabited aerial vehicles (UAV).[32] UAVs, such as the Predator and Global Hawk models, are used primarily for observation, but some have been armed by the US with Hellfire missiles and used in combat in Afghanistan, demonstrating their effectiveness as a weapons

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[30] Joseph T. Jockel, "Four US Military Commands: NORTHCOM, NORAD, SPACECOM, STRATCOM – The Canadian Opportunity," *Institute for Research on Public Policy Working Paper Series* no. 2003-03, 9 [journal on-line]; available from http://www.irpp.org/wp/archive/wp2003-03.pdf; Internet; accessed 5 July 2005.

[31] CPAC, "Speech by General Rick Hillier to Carleton University students on the occasion of the Annual Dick, Ruth and Judy Bell Conference" (1 October 2005).

[32] The Canadian Forces defines a UAV as an "uninhabited aerial vehicle." Other definitions may use "unmanned" as well as "unmanned combat air vehicle" (UCAV).

platform.[33] Like cruise missile guidance systems, UAVs or their component parts are available commercially.

The impact of 9/11 has likely reinforced terrorist attraction to commercial aircraft, both large and small. Enhanced security measures, such as airport/airline security, smart-borders and the introduction of biometric screening will reduce, but not eliminate, the likelihood that air attacks will be attempted in the same manner as on 11 September 2001. Furthermore, terrorists will continue to investigate new ways to circumvent and exploit security procedures in the global commercial aviation industry, such as introducing sleeper agents as airline or charter pilots.

Smaller, private aircraft could also be used against soft targets, and would be particularly effective if loaded with high explosives or a chemical or biological agent. Scenarios reported in the news involve aircraft rented or stolen for these types of operations. In September 1994, a lone individual stole a two-seat Cessna aircraft and crashed it on the White House lawn. Although this incident was not terrorist-related, it highlights the simplicity of stealing small, general aviation aircraft to create a threat platform. More recently, small general aviation aircraft violated the protected airspace around Cape Canaveral, Florida and Washington, DC, before being intercepted by fighter aircraft. This demonstrates the difficulty of sterilizing airspace from aircraft flying under visual flight rules, and perhaps not having filed a flight plan, or even "squawking" a

[33] Isenberg, "The Real Missile Threat…", 3.

transponder code.[34] Closer to home, there were three incursions of the sterile airspace around Kananaskis during the 2002 G8 Summit; all this while CF-18 fighter aircraft flew protective "combat air patrols" (CAP) and E3-A Airborne Early Warning and Control System (AWACS) aircraft provided surveillance of the airspace.[35] Granted, the aircraft were successfully intercepted and diverted without incident, and would certainly have been destroyed had they proven hostile, however, it is clear that the threat of general aviation aircraft being used as WMD platforms is a very real possibility.

Ultra-light aircraft, powered hang-gliders, or powered parachutes could also be used in a variety of ways: covert insertion of terrorists; grenade or weapons attack; chemical or biological agent dissemination; or suicide bomb attack. Another possibility, as mentioned above, is UAVs, which would enable terrorists to evade security countermeasures targeted against on-the-ground threats and provide them with limited standoff and precision-delivery options, albeit technically more difficult. Terrorists could also use lighter-than-air-balloons or commercial blimps to deliver ordnance, disseminate

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[34] VFR, or *Visual Flight Rules*, governs the procedures for conducting flight under visual meteorological conditions. Visual meteorological conditions (VMC) expressed in terms of visibility and distance from cloud, equal to or greater than the minima specified in Canadian Aviation Regulations 602. Specifically, VFR are a set of aviation regulations under which a pilot may operate an aircraft, if weather conditions are sufficient to allow the pilot to visually control the aircraft's attitude, navigate, and maintain separation with obstacles such as terrain and other aircraft. A pilot flying under VFR is usually required to stay at least a specified distance away from clouds and must stay in areas where the visibility meets minimum requirements. The pilot is responsible for seeing and avoiding other aircraft, terrain, and obstructions such as buildings and towers. Being in contact with air traffic control is optional in most airspace, and the pilot is usually allowed to select the course and altitude to be flown even when in contact with ATC. The term "VFR" is also used to indicate the weather conditions that are equal to or greater than minimum VFR requirements. In addition, "VFR" is used by pilots and controllers to indicate type of flight plan. Aircraft flying VFR (in North America) normally select a non-discreet transponder code of "1200" below 12,500 feet above sea level, or "1400" between the altitudes of 12,500 and 18,000 feet above sea level; they may also have no transponder signal and be undetected by secondary surveillance radars. NavCanada, *Air Traffic Control Manual of Operations,* ATS Publications (22 Jan 2004); available on CD-ROM, ATC-DEF 19.

[35] Major B.P. Barnes, 552 Sqn, Tinker Air Force Base, Oklahoma, telephone conversation with author, 10 December 2005.

chemical or biological agents, or to fill with explosives and employ as a suicide bomb. All of these scenarios pose a credible threat that CANR must be prepared to counter.

> The potential for another terrorist strike in North America remains high, leaving Canadians with a vulnerability that is likely to persist well into the future… several Western countries – including Canada – have been singled out by terrorist movements in their public declarations…[36]

But is Canada truly a target for terrorist attack, or is the above strategic assessment self-serving by defence institutions? On 17 January 2002, Stewart Bell and Steven Edwards reported in their *National Post* article "Terrorist Plots for Canada Revealed", of a laptop computer found in an al-Qaeda safe house in Afghanistan. The authors reported "the computer files are the latest indication that Islamic terrorists have considered attacks within Canada, particularly against Jewish targets" and added "al-Qaeda has a significant presence in Canada."[37] In a taped message on 12 November 2002, Osama bin Laden identified Canada as a target for attack.[38]

In May 2004, the al-Qaeda terror network stated it "view(ed) Canada as a legitimate target because it is a 'selfish' nation committing 'terrorism' against Muslims around the world."[39] In October 2004, the *National Post* printed a statement by the

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[36] Canada, Department of Foreign Affairs and International Trade, *Canada's International Policy Statement: A Role of Pride and Influence in the World – Overview*, (Ottawa: Her Majesty the Queen in the Right of Canada, 2005), 7.

[37] United States, Department of State, "Patterns of Global Terrorism: 1999 North America Overview," available from http://www.state.gov/www/global/terrorism/1999report/noamer.html#Canada; Internet; accessed 25 February 2006.

[38] Canada, Privy Council Office, *Securing an Open Society: Canada's National Security Policy* (Ottawa: Her Majesty the Queen in the Right of Canada), 6.

[39] Statement by an unnamed Islamabad spokesman as quoted by Jeffrey Imm, "Jihadists Waging Holy War Against the West," *National Post* (14 May 2004); available from www.jihadwatch.org/archives/2004/05/001.html; Internet; accessed 5 March 2006.

Canadian Security Intelligence Service (CSIS) from its annual report to Parliament, that warned of continued terrorist attacks and the necessity for "unrelenting vigilance" to avoid catastrophe, stating "Canada is not immune from acts of terrorism. As Canada continues to be an active player in the international struggle against terrorism, it will face increasing threats from transnational terrorist organizations."[40]

Even more specifically, in some circles Canadian support to Israel is also seen as support to the oppression of Palestinians. The "terrorist" state of Israel and by proxy Canada is an enemy of Jihad.[41] Adding to this worry is the bare fact that Canada is a "soft target."[42] Terrorism expert Eric Margolis told CTV's *Canada AM* on 20 January 2006 that Canadians "should be very concerned" about the al-Qaeda threats to carry out more attacks on the West, as Canada's involvement in Afghanistan meant it was "on the list of targets" and was a "softer target" than the US.[43] The fact that Canada is a soft target is acknowledged in the *2005 International Policy Statement*, which also declares "complacency has been punished by those looking for 'soft' targets."[44]

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[40] Stewart Bell, "Guard Against al-Qaeda, CSIS Report Warns Canada," *National Post*, 29 October 2004, A4.

[41] Hanna Kawas, "Silence on Israeli Terrorism is COMPLICITY," Letter to Prime Minister Paul Martin, *Canada Palestine Association*, available from http://www.cpavancouver.org/statements_letterToPaulMartin_1.html; Internet; accessed 5 March 2006.

[42] Joseph S. Nye Jr. defines soft power as the ability to get what you want by attracting and persuading others to adopt your goals. It differs from hard power; the ability to use the carrots and sticks of economic and military might to make others follow your will. Both hard and soft power is important in the war on terrorism. Joseph S. Nye Jr., "Propaganda Isn't the Way: Soft Power," *The International Herald Tribune*, 10 January 2003; available from http://www.ksg.harvard.edu/news/opeds/2003/nye_soft_power_iht_011003.htm; Internet; accessed 15 April 2006.

[43] Eric Margolis, as quoted by *CTV Canada AM*, "Canada 'Soft Target" for al-Qaeda: Terror Expert" (20 January 2006), http://www.ctv.ca/servlet/ArticleNews/print/CTVNews/20060120/osamabin_laden_06012.htm; Internet; accessed 5 March 2006.

[44] Canada, *International Policy Statement*, 7.

As recently as 04 March 2006, Ayman Al-Zawahri broadcasted a statement on *Al-Jazeera* criticizing the West for insulting Islam's prophet. He stated there would be "payback" against western countries for the publishing of cartoons offensive to the Prophet Mohammad, and urged Muslims to conduct new strikes against the West. One of these countries is Canada. Zawahri added: "(Muslims have to) inflict losses on the crusader West, especially to its economic infrastructure, with strikes that would make it bleed for years…The strikes on New York, Washington, Madrid and London are the best examples."[45]

Furthermore, we are not just vulnerable to terrorists from the 'outside' but also from within. Addressing a counter-terrorism symposium at the Royal Military College of Canada in 2002, Mr. M. Kelly of CSIS reported that "at least 75 Islamic militants were living in Canada at the time of September 11th" and "The next step will be attacks on Canada itself."[46] Perhaps, Mr. Kelly summarizes the situation in Canada best when he reports: "The truth is, we're a western society, we're rich by global standards, and there are folks out there who think that we are part of the problem. The threat is real, it's immediate, it's [sic] here."[47]

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[45] *CTV News eTalkDaily Top Stories*, "Al-Zawahri Urges More Attacks on the West" (4 March 2006), http://www.ctv.ca/servlet/ArticleNews/story/CTVNews/20060304/zawahri_msg_060304/2.html ; Internet; accessed 5 March 2006.

[46] Canadian Press, "Terrorist Threat is Here," *Halifax Chronicle Herald* (9 March 2002) in Colonel Brian W. Akitt, "Fanatical Terrorism: Is Canada ready for a Terrorist Attack?" (Toronto: Canadian Forces College National Security Studies Course 4 Paper), 15.

[47] *Ibid*.

According to Stewart Bell, author of *Cold Terror*, more that 50 terrorist organizations have a presence in Canada, ranging from al-Qaeda to Hezbollah to the Egyptian Islamic Jihad."[48] Further, CSIS reports support this assertion:

> With perhaps the singular exception of the United States, there are more international terrorist groups active here than any other country in the world. The Counter-Terrorism Branch of CSIS is currently investigating over 50 organizational targets and about 350 individual terrorist targets. Terrorist groups are present here whose origins lie in virtually every regional, ethnic and nationalist conflict there is.[49]

Many of these terrorists, or even would-be terrorists, are undetected and untracked by Canadian authorities. "It is disconcerting that 36,000 individuals subject to deportation cannot be located, let alone expelled."[50] Furthermore, the majority of al-Qaeda recruits in Canada are being trained at home, not abroad, making the terror network a direct threat to Canada, according to a recently declassified intelligence report. Canadian recruits are highly prized for their familiarity with Western societies, says a *Canadian Security and Intelligence Service* report, obtained by the *Toronto Star*. Michele Juneau-Katsuya, who spent 21 years as a CSIS agent, told the *Star* that the US campaign itself has fuelled anger and frustration in a new generation of potential al-

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[48] David T. Jones, "When Security Trumps Economics – The New template of Canada-US Relations," *Policy Options* (June-July 2004) [journal on-line], available from http://www.irpp.org/fasttrak/index.htm; Internet; accessed 12 November 2005.

[49] Ward Elcock, "Submission to the Special Committee of the Senate on Security and Intelligence," (Ottawa: Canadian Security Intelligence Service, 1998), as quoted in Colonel J.J. Selbie, "Homeland Security: A Canadian Perspective," *Strategy Research Project*, (Pennsylvania: US Army War College, 2001), 18.

[50] Jones, "When Security Trumps …" 76.

Qaeda fighters. Globalization and the "CNN effect"[51] is assessed to radicalize the young people of Canada, as every night they "(see) what's going on around the world and (are) simply frustrated, horrified or disgusted."[52] Furthermore, anti-globalization and anti-westernization movements in the Arab-Islamic world are increasing frustration, resentment and anger, fomenting terrorism.

The Canadian Forces openly recognized this threat in a 2005 Chief of Defence Staff Action Team Report: "The Canadian homeland is at risk from trans-national terrorist organizations such as al-Qaeda, which have the ability and willingness to cause a level of damage and destruction once reserved solely for nation-states."[53] The interrelated nature of domestic and international threats to Canadian security, brought about by the increasingly globalized world, is apparent to those that heed the signs, and there is a link between failed and failing states and the use of these environments by terrorists from which to plan and mount operations against North America. The terrorists themselves have openly announced Canada as a target. The terrorist threat to Canada is

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[51] *Globalization* (or globalism) refers to the worldwide phenomenon of cross-border technological, economic, political and cultural exchanges, brought about by modern communication, transportation and legal infrastructure as well as the political choice to consciously open cross-border links in international trade and finance. It is a term used to describe how human beings are becoming more intertwined with each other around the world economically, politically, and culturally. Although these links are not new, they are more pervasive than ever before. The *CNN Effect* is the effect that continuous and instantaneous television may have on foreign policy, in the making of foreign policy and the conduct of war, particularly when the horrifying images of war and tragedy are transported into the living rooms of a nation. Wikepedia: The Free Encyclopedia, available from http://en.wikipedia.org/wiki/; Internet; accessed 15 April 2006.

[52] *CBC News*, "Al-Qaeda's Canadian Recruits 'Highly Prized': Report," (4 May 2005), http://www.cbc.ca/story/canada/national/2005/05/14/alqaeda-canada050514.html; Internet; accessed 5 March 2006. Interview with Michele Juneau-Katsuya also available in greater detail from http://www.foi.missouri.edu/terrorintelligence/terrorgps.html.

[53] Canada, Department of National Defence, "Chief of Defence Staff Action Team 1 Report," March 2005, 2.

clear. This paper will now examine the tools and mechanisms available to CANR in addressing this threat.

RADAR SURVEILLANCE COVERAGE

In order to carry out its mission to "deter, detect and defeat," CANR must have the capabilities to do all three. In the context of protecting Canada from airborne terrorist attacks, CANR must first and foremost have adequate aerial surveillance capabilities, and these capabilities must ensure there are no vulnerabilities that may be exploited.

The North Warning System (NWS) provides aerospace surveillance of potential attack routes via Arctic and North Atlantic airspace. The North Warning System consists of 15 long-range radars (eleven in Canada, four in Alaska) and 39 short-range radars (36 in Canada, three in Alaska) along the northern edge of North America. The radars form a 4,800-kilometer-long and 320-kilometer-wide "tripwire" stretching from Alaska to Newfoundland.[54] These unmanned sites are remotely monitored and controlled from the in North Bay on a 24/7 basis. The information they receive is automatically sent to the CADS at 22 Wing, also in North Bay, over a long-haul satellite communications network.

Other sensor systems used by CADS/CANR include: the Canadian Coastal radars; Canadian Forces Terminal Radar and Control System (TRACS) radars at most of the

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[54] The North Warning System (NWS) became operational in 1985. Portions of the 1960 Pinetree system were incorporated into the new NWS. The AN/FPS-124 is a short-range, two-dimensional (no height information) Doppler array surveillance radar, installed as gap fillers between the North Warning System long-range radars. The AN/FPS-117 Minimally Attended Radar system is a long-range three-dimensional radar. The AN/FPS-124 UAR (unattended radar) is an L-band (1215-1400 MHz) radar with a 5-70 nm range, 10,000-foot height and accuracy of plus/minus .25 nm and plus/minus .5 degrees. The AN/FPS-117 is a low power, L-band pencil beam, solid-state transmitter and beacon interrogator search radar with a 5-200 nm range, 100,000 foot height, capable of defence against anti-radiation missiles and is electronic counter-counter measures (ECCM) capable. The NWS is supported by five Logistics Support sites (LSS). North American Aerospace Defense, *Ibid*., and http://www.fas.org/nuke/guide/usa/airdef/radar.htm; Internet; accessed 21 February 06.

main operating bases; the Terminal Radar and Display System (TRADS) at Goose Bay, Labrador, the TPS-70 tactical control radar systems; two Joint Surveillance System (JSS) radars; NavCanada (NAVCAN) Radar Modernization Program Sensors (RAMPS) interior radars and some filtered Federal Aviation Administration (FAA) track information. Maximizing the data sharing of NAVCAN and NORAD radars also fosters a closer working relationship and optimizes each respective mission.[55]

The Joint Surveillance System is a network of long range surveillance radars, primarily operated and maintained by the FAA, but providing communication and radar data to both the FAA and NORAD, also enabling "integration in the interior of the US of military and civil (FAA) airspace surveillance and aircraft/air traffic control systems into a single system."[56] Joint Surveillance System radars in the northwestern and northeastern corners of the continental United States (CONUS) feed information to CADS/CANR.

The sensor systems augment one another to some degree to provide varying levels of geographic altitude, and range coverage, enabling a fairly flexible command and control platform for long-range detection and engagement of airborne threats. Sensor data from all available sources is fed to the CADS Battle Control System–Fixed (BCS-F). The BCS-F is a next-generation air sovereignty command and control system for use by NORAD. Advanced technology incorporates increased sensor capacity and improves

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[55] NAVCAN receives radar feeds from two NWS FPS-117 radars at Brevoort Island and Saglek, and the two TPS-70s (in addition to their own RAMP radars). With the advent of the Polar Routes, NAVCAN [hopes] to receive feeds from eight additional NWS 117s and 2-4 additions ANR 117s, and increase their coverage along the Canada/US border utilizing some of the JSS radars. Major Michael O'Driscoll, A3 Aerospace Systems, 1 Canadian Air Division Headquarters, e-mail 17 March 2006.

[56] John Anderson, "Canada and the Modernization of North American Air Defense," in *The US Canada Security Relationship: The Politics, Strategy and Technology of Defense*, ed. David G. Haglund and Joel J. Sokolsky, 167-183 (Boulder, CO: Westview Press, 1989), 168. For additional information on the JSS and ARSR-4 Air Route Surveillance Radars, see http://www.fas.org/nuke/guide/usa/airdef/arsr-4.htm.

interoperability among hundreds of legacy sensors. The system correlates and fuses data from airborne, ground and naval elements and civil air traffic sensors into an integrated air picture that allows commanders to and monitor the airspace above, beyond and within the US and Canadian borders. BCS-F communicates via the military's most advanced secure data-links and translates for, and acts as, a gateway among systems that were not previously interoperable.[57]

The data fed to the BCS-F is processed and correlated with flight planning data from NavCanada (NAVCAN) and the Federal Aviation Administration (FAA) to enable system identification of unknown tracks or tracks of interest (TOI). Since the dismantling of the southern-based Pinetree Line radars in the late 1980s, CADS/CANR has had to rely almost exclusively on civilian radars for tracking aircraft within Canada. As the various radars feed the CADS/CANR system, applicable data is displayed to allow the operational commanders to make decisions as to level of response required, if any, from monitoring to neutralizing or destroying the target. Table 1 lists the CANR radar sites; Table 2 lists the contributing air traffic control (ATC) radars.

[57] Major O'Driscoll, *Ibid*. The BCS-F is currently undergoing final Operational Test and Evaluation (OT&E) and is expected to reach full operational capability (FOC) in the CADS in Spring 2006. More information on BCS-F available from *Raytheon Media Relations*, "Battle Control System – Fixed," http://www.prnewswire.com/cgi-bin/micro_stories.html.

Table 1 – CANR Radar Sites

Canadian Coastal Radars	
R02	Holberg
R51	Barrington
R52	Sydney
R54	Gander
Canadian Tactical Control Radars	
M01	Cold Lake
M50	Lac Castor
North Warning System Radars	
NAO	Single Point
NBO	Cape Parry
NCO *	Lady Franklin Point
NDO	Cambridge Bay
NEO	Shepherd Bay
NFO	Hal Beach
NGO	Dewar Lake
NHO	Cape Dyer
NJO	Brevoort island
NKO	Saglek
NLO	Cartwright
* *NCO burned down and has not been replaced*	
Military ATC Radars (TRACS)	
CYQQ	Comox
CYOD	Cold Lake
CYTR	Trenton
CYBG	Bagotville
CYZX	Greenwood

Table 2 –Contributing ATC Radars

Joint Surveillance System Radars	
J80	Makah
J54	Caribou
NAVCAN RAMP Radars	
CYYR	Goose Bay
CYYT	St Johns
CYJT	Stephenville
CYHZ	Halifax
CYQM	Moncton
CYZV	Sept Isles
CYQB	Quebec City
CYUL	Montreal
CYOW	Ottawa
CYYZ	Toronto
CYHM	Hamilton
CYXU	London
CYYB	North Bay
CYAM	Sault Ste Marie
CYQT	Thunder Bay
CYWG	Winnipeg
CYQR	Regina
CYXE	Saskatoon
CYEG	Edmonton
CYYC	Calgary
CYXS	Prince George
CYKA	Kamloops
CYVR	Vancouver
CYYJ	Victoria
CYZP	Sandspit

Source: 1 Canadian Air Division Headquarters

Primary radar relies on the reflected energy of ultrahigh frequency pulsed radio beams to determine the direction and range of a target. How much an object reflects depends on its size, shape and material. In contrast, secondary surveillance radar (SSR) continuously transmits interrogation pulses and does not rely on reflections. Any aircraft within range and with an operating transponder responds with a four-digit selectable transponder code that identifies itself. The interrogation signal is completely separate from any primary signal.

Additionally, as the reply is not just a reflection much less power is needed, typically around one kilowatt for interrogation pulses, slightly less for replies. Therefore, the SSR antenna is less expensive and the range is much greater than with primary radar. Range and direction can be determined from the SSR signal in much the same way as with primary radar, with the additional advantage that the transponder can also emit a variety of different modes, both secure and non-secure, for air traffic and/or air defence use. Information such as altitude can be encoded into the transponder's reply, improving the ability to see, identify and control the aircraft. Data from an SSR interrogated target is displayed on the controller's radar screen as a digital tag correlated with the target thereby enhancing conventional radar and reducing confusion between inidividual aircraft and between aircraft and other objects such as birds and weather. An aircraft without an operating transponder may still be observed, but without an identifying tag.

In today's high density air traffic environment and with the availability of SSR technology, primary radar is used less and less by civil air traffic control, and restrictions are placed on the busier airspaces dictating that aircraft must have an operating transponder. Often controllers will deselect the primary radar to reduce the clutter in airspaces where aircraft are required to operate with a transponder, such as in the vicinity of major airports or above 18,000 feet. Consequently, the evolution of upgraded radars by the FAA and NAVCAN has resulted in many civil aviation radars being SSR only, creating 'radar holes' in the primary surveillance coverage within which aircraft are simply not seen on radar, particularly if they are "non-cooperative," that is, not squawking a transponder mode/code. Until 9/11, this was not considered a problem. On that fateful day al-Queda terrorists very astutely turned off the aircraft transponders and

'dropped' from secondary radar coverage. This delayed the appropriate air defence response as controllers worked through civil procedures to regain identification and communications with the aircraft, ultimately concluding that the problem was a civil air emergency.[58] Post 9/11, this situation now evokes a Noble Eagle response, however the problem of reacquiring and re-identifying the track remains, rendering the CANR intercept mechanisms ineffective.

Since 9/11, the US has made great strides to have the interior FAA radars included in the NORAD system, integrating 51 additional interior ATC radars, as well as a proposed surveillance data network and sensor enhancement projects to increase the height finding capability of ATC primary radars.[59] In Canada, while the realization of this new threat was swift within the Air Force, and particularly within the Air Defence community, the perception of near complete SSR coverage versus reality of very poor primary coverage persisted amongst greater military and civil authorities. Figures 5.1 and 5.2 show the primary and secondary surveillance coverage of Canadian airspace, presenting a very graphic illustration of Canada's vulnerability to a 9/11-type scenario.

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[58] Don Phillips, "Pentagon Crash Highlights a Radar Gap," *Washington Post* (3 November 2001), available from http://www.washingtonpost.com/ac2/wp-dyn?pagename=article&node&contentId=A32597Nov2; Internet; accessed 21 March 2006.

[59] Dr. Steven R Bussolari. "Surveillance Implications of 9/11." *MIT Lincoln Laboratory Briefing* (2 May 2002); available from http://spacecom.grc.nasa.gov/icnsconf/ docs/2002/11/Session_E2-4_Bussolari.pdf; Internet; accessed 12 November 2005.

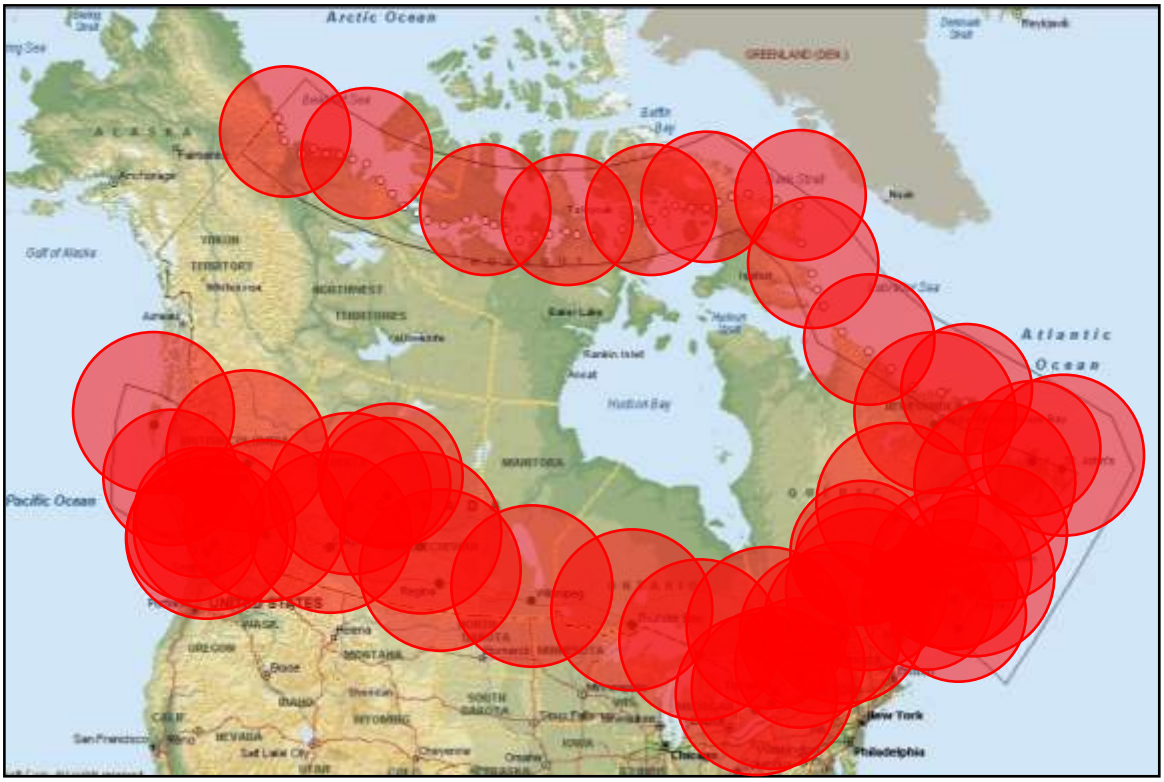

Figure 5.1 Secondary Surveillance Radar Coverage
Source: 1 Canadian Air Division Headquarters

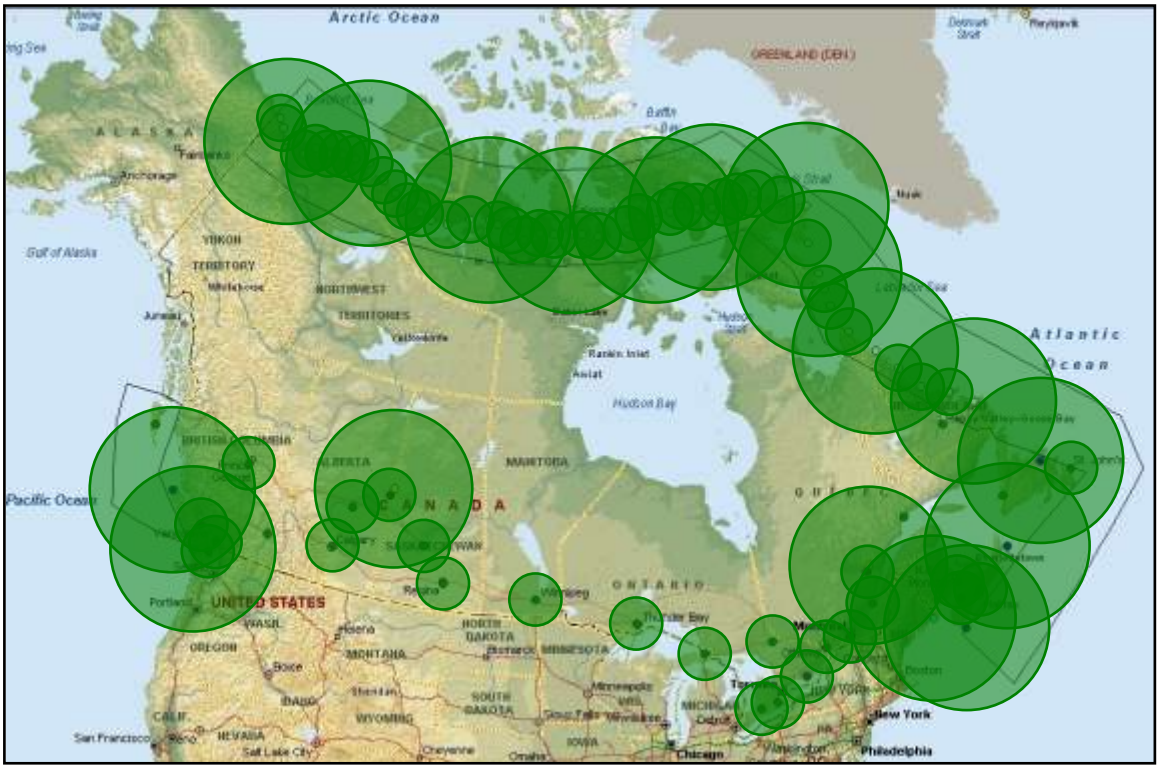

Figure 5.2 Primary Surveillance Radar Coverage
Source: 1 Canadian Air Division Headquarters

Having established that the primary surveillance radar coverage is woefully incomplete, the question we now must ask is do we *need* complete radar coverage? A large majority of Canada's territory is sparse and uninhabited, and the major metropolitan centres have approximately 80 nautical miles radius of primary radar coverage and up to 200 nautical miles of secondary radar coverage. However, many flight paths for both domestic and international flights pass through the radar holes, and are controlled "procedurally" using vertical, lateral and longitudinal separation rules based on time, speed and distance calculations.

The North Atlantic Route (NAR) system feeds westbound flights from Europe to points in eastern and central North America. These tracks enter Canadian airspace via the eastern coast of Labrador under control of Gander Oceanic and Gander Domestic Flight Information Region (FIR), or via the northeastern coast of Labrador, under control of Montreal FIR. Figure 5.3 presents a rudimentary depiction of these tracks. The flights are acquired on radar by the CADS as they approach the Canadian Air Defence Identification Zone, and shortly after by NAVCAN air traffic control sensors. However, as they continue inland, they soon fly through radar coverage and into a 'radar hole' over northern Quebec and points west.

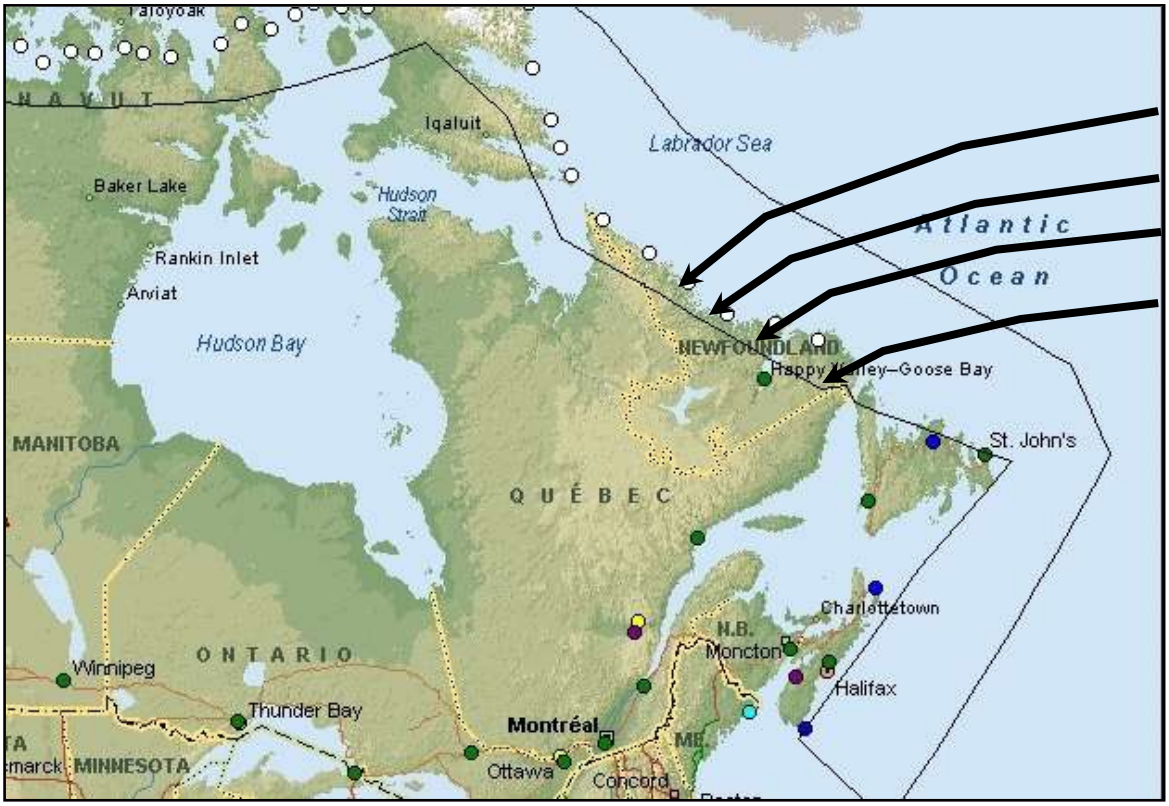

Figure 5.3 North Atlantic Route (NAR) System – Westbound Routes
Source: NavCanada

The increasingly technological air traffic system presents further challenges to surveillance over the vast Canadian territory. The Polar Route program brings flights from Europe into North America from points even farther north than the North Atlantic Route system, as depicted in Figure 5.4. Since 1999, the Polar Route program has also added four bi-directional routes between Russia, Mongolia and China, and North America, with flights transiting through Canada from the north and northwest as depicted in Figure 5.5.

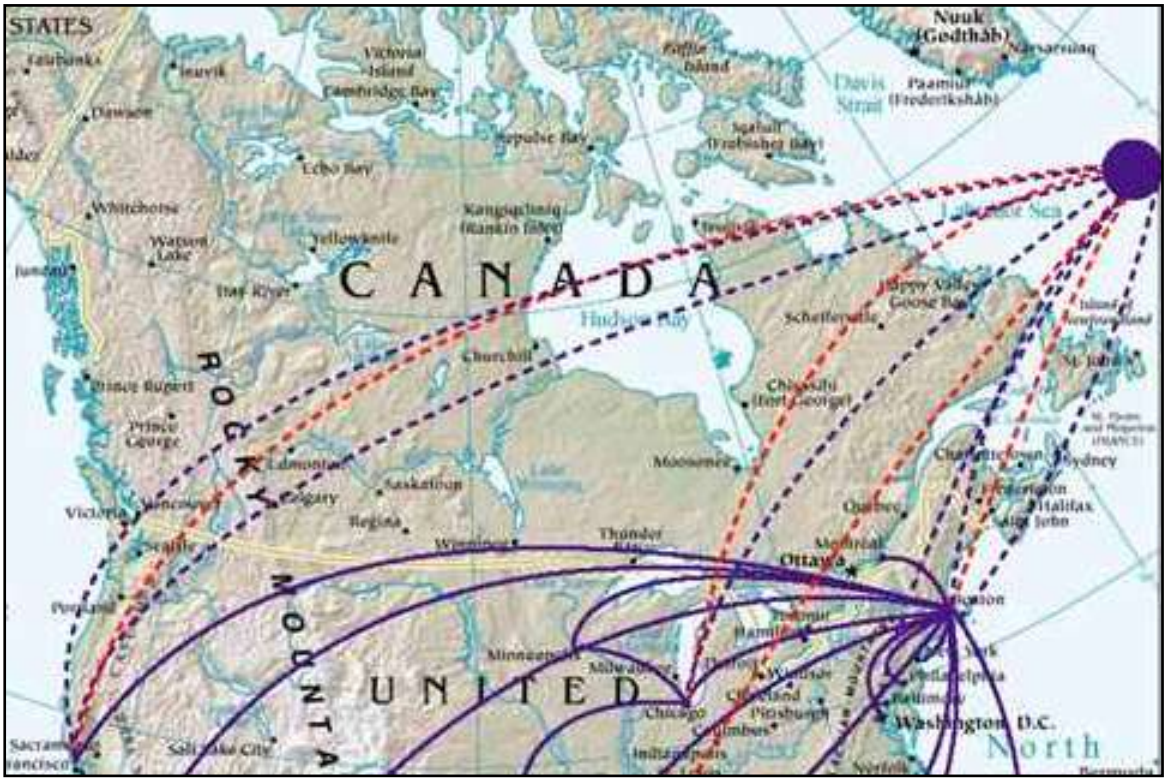

Figure 5.4 Polar Air Routes – Europe
Source: Polar Airways, "Polar Airways Main Route Map," http://www.polarairways.com/routemap.html; Internet; accessed 6 March 2006.

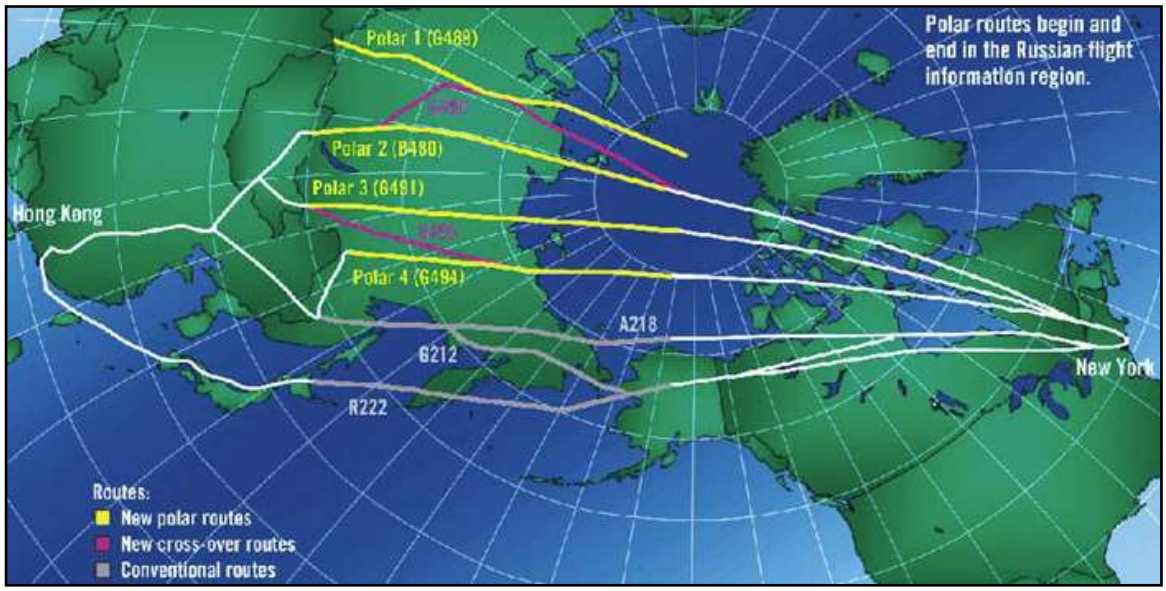

Figure 5.5 Polar Air Routes – Asia and Russia
Source: Aero 16, "Polar Routes Offer New Opportunities," http://www.boeing.com/commercial/aeromagazine/aero_16/polar_route_opportunities.html; Internet; accessed 3 March 2006.

In cross-referencing the routing depictions with the primary surveillance radar coverage, it is evident that airliners inbound via the polar routes and the North Atlantic Routes fly through 'radar holes.' These present severe areas of vulnerability that can be exploited: simply by turning off the aircraft transponder, the aircraft is rendered non-compliant in SSR only coverage areas and "drops off" the radar; likewise, there will be only a primary return with no data tag once it enters primary surveillance coverage, with no method of re-acquiring or re-identifying the target. If Canada is serious in its defence against aerial terrorism, a robust surveillance network is needed, and this does not currently exist.

ADDRESSING THE SURVEILLANCE VULNERABILITIES

The radar surveillance vulnerabilities are well recognized by NORAD and CANR, and several projects have been initiated to alleviate the weaknesses and mitigate the risks. To what extent these projects and initiatives will enhance the CANR mission is dependent on several factors, such as: the technological development of the systems, Canada's fiscal commitment to enhancing security, and the timeline for acquisition and implementation of any new system.

HOMELAND AIR AND CRUISE MISSILE DEFENCE OF NORTH AMERICA

"Homeland Air and Cruise Missile Defence (HACMD) of North America," renamed in March 2005 from "Low Altitude Air Threat Defence of North America," is a project that has been in development by NORAD for some time to address the systemic deficiencies in capability that is integral to the primary mission of NORAD, CANR, and the Canadian Forces. A US initiative, this project "establishes procedures for employing

highly responsive, scalable, integrated air defense [sic] packages designed to defend designated venues in coordination with intergovernmental partners…"[60] Canada-US cooperation for implementation of this project was very specifically highlighted in the Commander NORAD's March 2006 statement to the Senate Armed Services Committee.[61]

Homeland Air and Cruise Missile Defence of North America is a key element of the NORAD mission and is one of NORAD's 16 Critical Capabilities.[62] Currently HACMD is limited due to significant capability gaps in the areas of Wide Area Air Surveillance, Battle Management Command Control and Communications, and threat engagement capabilities. Current air surveillance systems provide short warning times and incomplete coverage of Canada's interior at low altitudes resulting in the Wide Area Air Surveillance deficiencies. Surveillance of the vast number of merchant ships, which could be potential cruise missile or UAV launch platforms, is also limited. Persistent full time wide area air surveillance of Canadian airspace including maritime approaches is required to detect and identify targets.

Current systems and doctrine do not fully support requisite levels of integration and interoperability resulting in the Battle Management Command Control and Communications deficiencies. Battle management systems and doctrine are required to

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[60] United States, House Armed Services Committee, *Statement of Admiral Timothy J. Keating, USN, Commander United States Northern Command and North American Aerospace Defense Command Before the Senate Armed Services Committee 14 March 2006*; available from www.senate.gov/~armed_services/statemnt/2006/March/Keating%2003-14-06.pdf; Internet; accessed 16 April 2006, 17-18.

[61] *Ibid*.

[62] Canada, 1 Canadian Air Division Headquarters, "NORAD Critical Capabilities Briefing," (September 2003).

integrate and coordinate all aspects of joint bi-national military and civilian agency participation in the HACMD of North America project. Identification and classification systems that support the stringent timeline and engagement requirements of the Homeland Air and Cruise Missile Defence project are necessary.

Finally, the current weapons systems infrastructure within Canada does not meet the needs of the HACMD of North America project resulting in engagement deficiencies. The Canadian Forces has no method of engaging targets with an integrated ground-based air defence system. A robust and integrated system of ground based air defence, fighter aircraft on alert posture, and random air patrols must be capable of neutralizing threats detected anywhere in the country before the threats can reach their targets.

Until recently, overcoming these gaps was a relatively low priority and technology was not sufficiently advanced to viably address these deficiencies. However, as discussed in the threat assessment section of this paper, the threat of unconventional attack has increased and the range of potential weapons has expanded. The events of 9/11 marked the emergence of credible and capable threats to North America by non-state actors and have highlighted the potential for serious threats from rogue nations and failed states. This coupled with the rapid advancement and proliferation of technologies applicable to cruise missiles and UAVs has greatly increased the priority of addressing longstanding HACMD operational capability deficiencies.

Acknowledging the lack of Canadian capability to detect, track, and identify airborne objects throughout much of the CANR area of responsibility, the Commander CANR (also Commander 1 Canadian Air Division and the Joint Force Air Component Commander for Canada Command) endorsed a “Statement of Capability Deficiency”

reinforcing the requirement for an accurate, real-time, interoperable command and control capability, and a requirement for that capability to engage any and all air threats in a timely and decisive manner appropriate to the threat.[63] The HACMD task requires Canadian Forces attention to enhancement of air surveillance capabilities to allow immediate detection, tracking, identification, and assessment of tracks of interest; expansion of NORAD's integration with military and non-military agencies within Canada and the US;[64] and, the nature and distribution of weapons systems capable of engaging non-compliant tracks of interest within Canadian airspace. Identified as an essential strategic priority, the Commander CANR recommended to the Chief of the Air Staff that resolution be given the highest priority. However, he also acknowledged the protracted timeline for acquisition of any new system, especially one with a high price tag as the Homeland Air and Cruise Missile Defence of North America project would entail, and further recommended that all interim mitigation measures be pursued.

NORTH AMERICAN AIR DEFENCE MODERNIZATION (NAADM)

Further to Homeland Air and Cruise Missile Defence Project, yet in a broader sense, in a May 2005 report to the Deputy Minister of National Defence, the *Defence Science Advisory Board* stated that a micro-satellite program is the only effective method of achieving a continuous and comprehensive coverage of Canada's landmass and airspace. The report went on to state that "a constellation of small Earth Observation satellites, together with the use of aircraft, unmanned aerial vehicles and other

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[63] MGen J.J.C. Bouchard, "Homeland Air and Cruise Missile Defence of North America (HACMD of NA) – Statement of Capability Deficiency." (1 Canadian Air Division: file 2790-1 (CANR DS), 23 March 2006).

[64] *Ibid*. Interagency participation is required to maximize the effectiveness of the bi-national interoperable and interagency "Family of Systems" (FoS) that will perform the NORAD mission.

conventional means can provide an effective Canada-wide surveillance and response capability."[65] The report recognizes the new security environment and factors such as increased commercial traffic and activity in Canada's northern regions. Without directly saying so, the report implied that the current system, which does not use space-based surveillance or UAVs, does not provide competent surveillance of Canadian territory and airspace.

Some research has been done to provide radar coverage all across the northern part of Canada, much like the old Pinetree Line radars, with a significantly better capability due to advances in technology. However, still in the investigation stage, it is estimated to be at least 2020 before the first fielding of this new system. The Tactical Control Radar replacement program headed by the Directorate of Air Requirements at National Defence Headquarters in Ottawa has contracted for the purchase of three new state of the art mobile air defence radars to allow Canada the flexibility to place radars where required in any contingency. However, these will be reserved for just that – contingency operations – such as was done during the G8 Summit in Kananaskis, Alberta, or as may be required for the 2010 Olympics in Vancouver. When not used in this or like capacity, they will operate in Cold Lake, Alberta and Bagotville, Quebec, replacing the aging TPS-70 mobile tactical control radars, thus will in actuality not add to the current radar surveillance coverage situation.

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[65] Canada, Department of National Defence, "Defence Science Advisory Board Report 04/04," ii. The DSAB Report 04/04 recommended five actions (abridged): (1) develop an indigenous capability for national surveillance and response; (2) ensure that the expanded national surveillance program is conceived and controlled in Canada, with DND being the lead agency; (3) ensure that the storage, analysis and distribution of the collected data is managed and controlled by Canadians; (4) designate one organization within DND to define, fund and manage the program; and (5) develop the infrastructure to support the micro-satellite program through a phased implementation approach, to include investment in a Tactical Optical Satellite (TopSat) program.

GROUND-BASED URBAN AREA RADAR DETECTION (GUARD)

On 10 March 2006, the Air Force announced the intention to install a Ground-Based Urban Area Radar Detection (GUARD) system around key economic regions and population centres.[66] The project, currently in the options definition phase, is intended to deal with part of the air surveillance and communications capability deficiency inside the country, highlighted by the re-defining of the NORAD mission post 9/11. Specifically, GUARD will concentrate on the critical economic regions and population centres of Canada by widening the air defence capability radii around these specific areas.

One of the options for project implementation is to upgrade or add to the current military and civilian air traffic control capability and link it into the NORAD command and control system at North Bay; another option is to have dedicated military sensors. This options analysis will define the number of systems to be acquired, which is estimated to be between five and seven, at a total cost of $125 million Canadian. However, the project timeline calls for a "Request for Proposals" and contract award no earlier than 2007, with an initial operational capability (IOC) in late 2008 and full operational capability (FOC) in 2011 at the earliest.[67] Finally, while it will enhance the air defence capability around specific vital points, it does not address the radar vulnerabilities along many of the air routes leading to the major centres, nor the radar holes from within which rogue cruise missiles or other platforms could launch and approach from.

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[66] Sharon Hobson, "Canadian Air Force to Install GUARD," *Jane's Defence Weekly* (15 March 2006), [journal-online]; available from http://www8.janes.com/Search/documentView.do?docId=/content1/janesdata/mags/jdw/history/jdw2006.htm; Internet; accessed 20 March 2006.

[67] *Ibid*.

AIRSHIP RADAR SYSTEMS

The Tethered Aerostat Radar System (TARS) currently provides air surveillance coverage along the southern border of the US and Puerto Rico. Originally established by US Customs, its primary mission is the detection of drug smuggling aircraft, however, it is currently operated by the US Department of Defence and contributes to the homeland security mission.[68] The next generation of this type of system is High-Altitude Airships (HAA), and this is acknowledged to have a huge potential for air surveillance. This system is an unmanned lighter-than-air-vehicle that would operate above the jet stream and above severe weather in a geostationary position to serve as a telecommunications relay and potentially provide overlapping radar coverage of maritime and air approaches. NORAD is currently seeking funding for a prototype high-altitude airship, with the idea of stationing ten ships to cover all the continental borders of the US.[69] The Air Force Experimentation Centre is closely following progress of this initiative for feasibility of acquisition by Canada. Yet again, it will be many years before CANR sees benefit from such a system.

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[68] Bussolari, "Surveillance Implications of 9/11," *Ibid*. There are ten CONUS TARAS sites from Arizona to Florida. The operating altitude is 10-15,000 feet, with a line-of-sight radar horizon of 250-300 km. Details on the Tethered Aerostat Radar System (TARS) are available from Federation of American Scientists, "Tethered Aerostat Radar System (TARS)" http://www.fas.org/nuke/guide/usa/airdef/tars.htm; Internet; accessed 25 February 2006.

[69] Stephen T. Makrinos, "High Altitude Airships for Homeland Security: Commercial and Military Operations," *CACI White Paper* (9 February 2005), available from http://www.maritimesecurityexpo.com/whitepapersarticles/High_Altitude_Airships_for_Homeland_SecurityI_Final-1.pdf; Internet; accessed 21 March 2005. The Stratospheric Platform System, as NORAD terms the proposed system of HAAs, is an unmanned, powered airship that can maintain a relatively geostationary position at 70,000 feet. Lift is provided by helium. On station, the onboard sensors' surveillance coverage extends over the horizon. More details on HAA are also available from http://www.globalsecurity.org/intell/systems/haa.htm.

CELLPHONE RADAR SYSTEM (CELLDAR)

The Cellphone Radar System (CELLDAR) is a very promising, relatively inexpensive system that can provide good low-level coverage over major population centres. "CELLDAR is a ground-breaking technique that uses the reflection of digital telephone signals from the sides of aircraft or boats to detect and track their movement."[70] CELLDAR is a passive system, so its use cannot be detected, and is multi-static, which means there are many transmitters to enhance the radar cross section of targets when compared to a mono-static radar. Applications of particular interest to CANR include: ground based air defence, acting as a passive triggering system to cover blind spots; passive airborne early warning, allowing aircraft to look into an area without needing to transmit into it; and, homeland defence, monitoring air, ground and coastal movements. CELLDAR is anticipated to commence advance trials this year.[71] As with high altitude airships, the Air Force Experimentation Centre is also assessing this system for possible future use by Canada, and with the same distant and undetermined timeline.

PROJECT POLAR EPSILON

On 2 June 2005, the Department of National Defence announced the creation of *Project Polar Epsilon*, a $59.9 mission Joint Space-Based wide area surveillance and support capability that will provide all-weather, day/night observation of Canada's Arctic region and its ocean approaches. Using information from Canada's new RADARSAT 2 satellite, Polar Epsilon will enhance Canada's surveillance capability and increase Canada's ability to safeguard its borders, by providing surveillance in the Canadian

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[70] Roke Manor Research, "CELLDAR – Cellphone Radar System," http://www.roke.co.uk/sensors/stealth/celldar.asp; Internet; accessed 21 March 2006.

[71] *Ibid*.

Arctic and ocean approaches out to 1000 nautical miles. This information will provide commanders an up-to-date mission-planning tool as well as near real time imagery of their area of operations. *Project Polar Epsilon* will be completed by May 2009.[72] This sounds very promising to the uninitiated however; *Polar Epsilon* capability is for "Ground Moving Target Indication" (GMTI) only, and not for airborne objects, or "Airborne Moving Target Indication" (AMTI).[73] In fact, space-based AMTI is very complex and reports are that no one has yet resolved the associated problems. Therefore, while *Polar Epsilon* may contribute to search and rescue, sovereignty, or a ground-based Canada Command mission, it will not contribute to the CANR mission.

UAV SURVEILLANCE PLATFORMS

The US is working on a space-based transmitter and UAV receiver for AMTI, however this is also only a concept (as far as is reported in open sources). There have been many discussions on the future of UAVs in the Intelligence, Surveillance and Reconnaissance (ISR) role by various facets of the Canadian Forces, and in particular to aerial surveillance, by the newly formed Canadian Forces Aerospace Warfare Centre, but no confirmed plans have been formed on integrating UAV platforms with the air surveillance picture.[74]

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[72] Canadian Forces, "DND/CF News Room," http://www.forces.gc.ca/site/newsroom/view_news_e.asp?id=1674; Internet; accessed 6 March 2006.

[73] LCol A.H.J. Dupuis, Air Force Experimentation Centre, e-mail, 22 March 2006.

[74] LCol David MacKinnon, Aerospace Control, Canadian Forces Aerospace Warfare Centre, e-mail, 21 March 2006.

OVER THE HORIZON BACK-SCATTER RADARS

Second generation Over The Horizon Back-Scatter (OTHB) Radar is also proving to be a very capable system that could significantly enhance Canada's current capability, however, there is some resistance given that less than stellar performance of the previous US system. That said, the Australians and the US Navy are having great success with the second-generation system, however this is not being pursued by Canada as yet.[75]

HIGH FREQUENCY SURFACE WAVE RADAR NETWORK

The Canadian Forces is setting up a High Frequency Surface Wave Radar (HFSWR) Network to keep watch on the maritime approaches. The network will involve eight radars, two on the west coast and six on the east, designed to detect ships up to 200 nautical miles as they approach the Gulf of St Lawrence or the Straits of Juan de Fuca. Two sites on the east coast have been activated, with all eight stations expected to be on line by 2008.[76] The high frequency surface wave radar also has an airborne target detection capability, but it is mostly at low altitude, and as yet this system has not been assessed for integration into the continental air surveillance role.[77]

ADDRESSING THE VULNERABILITIES - SUMMARY

There are a multitude of systems that could conceivably satisfy Canada's air surveillance vulnerabilities. However, most if not all are still in experimentation phases, many do not have Canadian Forces project funding assigned, and those that are identified as a viable solution to capability deficiencies will not come to fruition for many years.

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[75] LCol Dupuis, *Ibid*..

[76] Elinor C. Sloan, *Security and Defence in the Terrorist Era,* (Montreal: McGill-Queen's University Press, 2005), 75-76.

[77] LCol Dupuis, *Ibid*.

Similar to the fate that befell the Distance Early Warning line with the advent of the Soviet Backfire bomber with air launched cruise missiles, CANRs surveillance systems continue to be victimized by the rapid changes in technology. Additionally, the "ponderous pace of procurement," which on average is 16 years from concept to close down, further exacerbates any acquisition initiatives.[78] Thus, it is reasonable to assess that the radar coverage vulnerabilities of CANR will remain for the foreseeable future.

COMMUNICATIONS COVERAGE

Similar to radar holes, there are communications 'blind spots' in Canada. These are areas of poor or nil radio reception within which the CADS is unable to communicate with the fighter interceptors it is controlling.[79] The deficiency in communications coverage has the potential to delay time sensitive orders to military aircraft, such as passing of engagement (shoot-down) authority from the Government of Canada should it be required. This is a critical capability that is lacking.

NAVCAN has far more extensive radio coverage as they operate from area control centres and terminal radar control facilities across the country, in contrast to the CADS operating from North Bay. Often, general instructions may be passed via NAVCAN controllers, however, for legal and security reasons, orders to conduct military actions cannot be authenticated properly or legally passed by civil controllers. In the

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[78] *Report of the Standing Senate Committee on National Security and Defence*, "Wounded: Canada's Military and the Legacy of Neglect – Our Disappearing Options for Defending the Nation at Home and Abroad," The Honourable Colin Kenny, Chair. (Ottawa: Parliamentary Publications Directorate, September 2005), 109. Details of the complexities and difficulties of the military and government procurement process are beyond the scope of this paper.

[79] Details of these blind spots are classified were not made available for this research.

event of a planned domestic operation where it is known that orders and instruction will need to be passed by direct military means, the Canadian Forces will deploy Aerospace Controllers as Military Liaison Controllers on an as required basis to the appropriate NAVCAN area control centre.[80] Armed with secure telephone units and authentication codes, the Military Liaison Controllers use NAVCAN radios to relay critical orders and instructions between the CADS and the air sovereignty alert fighters.

While absolutely effective, the use of Military Liaison Controllers has limited responsiveness and is a costly solution in terms of personnel and funding. On order, the controllers must transit from their normal place of duty such as the CADS in North Bay or a main operating base and reside "on call" near the designated NAVCAN area control centre. Therefore, the employment of Military Liaison Controllers is only practicable in the event of planned contingency operations.

After 9/11, NORAD discovered the same deficiencies in the interior of the continental US, and acted quickly to install repeaters. CADS/CANR does not utilize radio repeaters per se, nor are there plans to install radio repeaters, but there are plans to install additional radios at designated sites across Canada, and to share radios with the US Air Force at their Northern tier radar sites.[81] Additionally, there are agreements with several NAVCAN sites for them to allow CADS to use designated radios/frequencies for coverage when required. This potential greatly enhances CADS communications capabilities, though the extent of the enhancement and resultant coverage is classified. In the big scheme of defence procurement and spending, these fixes to the

[80] There are six Area Control Centres (ACC) across Canada: Vancouver, Edmonton, Winnipeg, Toronto, Montreal and Moncton.

[81] Major Michael O'Driscoll, *Ibid*.

communications holes are relatively inexpensive and technologically simple. Therefore this paper assesses that this risk has been adequately mitigated.

INTERCEPT ASSETS

In order for CANR to carry out the "deter, detect, defeat" mission, the Air Force must have the capability to counter the aerial terrorist threat, to include fighter interceptor aircraft and the associated air combat support functions. Yes, Canada has the CF-18. But to be responsive and effective, just having this fighter asset in the Air Force inventory is not enough.

> During the rundown of the CF over the last decade, the Air Force absorbed large reductions in personnel and units. The undesirable consequences of this rapid decline still linger in terms of force structure instability and weakness. When combined with a shortage of trained personnel and operational resources, the impact on operational readiness is significant.[82]

PERSONNEL

The Air Force faces a sustainability gap in its ability to generate operational capability to fulfill its roles in defence of Canada and Canadian interests. In the post 9/11 security environment, the changing nature of the threat places even further demands on these stretched resources. The severity of cuts failed, perhaps understandably in hindsight, to consider these new emerging threats. However, by comparison, "If fighter jets are not now needed to shoot down Soviet bombers, they are needed to protect our major cities from terrorist attacks…" or at least deter the threat.[83]

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[82] Conference of Defence Associations, "Caught in the Middle: An Assessment of the Operational Readiness of the Canadian Forces," (Ottawa: CDA, 2001), 23. In the 1990's, the Regular Air Force personnel ceiling was reduced from 23,000 to 13,500; Combat aircraft were reduced from 203 to 140.

[83] *Report*, "Wounded…, 59.

The Air Force lacks both spare parts and qualified personnel to conduct repairs.[84] This translates to extended repair time, which means that the Air Force will have fewer aircraft with which to respond to domestic crises, and a risk of going into emergencies with less-than-reliable equipment because the scarce technicians are so overworked. Furthermore, technician shortfalls have reduced the capabilities of the fighter force by 20 percent. The lack of skilled technicians is actually reducing the skill of pilots; the fewer the aircraft, the fewer flying hours. This impacts proficiency, reducing pilot exposure and experience. Adding to this difficulty is a comparable lack of pilots. Technicians and pilots are obviously the two most essential personnel categories when it comes to keeping planes aloft.[85]

> A decade and a half of cuts to defence spending are going to produce at least a decade and a half of vulnerability. We've got to try to do something about that. Canadians deserve better.[86]

The resource inadequacies are not limited to technicians and pilots, but to most occupations in the Canadian Forces, as is well documented. One other vital function in the CANR role is that of the Aerospace Controllers and Aerospace Control Operators who man the CADS and other air defence ground based assets on a 24/7 basis commensurate with the air sovereignty alert readiness posture. Aerospace control operations personnel monitor the airspace, initiate the air sovereignty alert response, and control the intercept. As discussed previously, the post-9/11 CANR/CADS mission

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[84] *Report*, "Wounded…Executive Summary…" 6. When the government directed the Air Force to reduce personnel in the 1990s, for instance, it should have been apparent that technicians should have been exempted – otherwise equipment couldn't be maintained. But technicians were axed and replacements were not hired, leading to a costly shortage that will take years to fix. It takes eight years of classroom and on-the-job training to qualify an aircraft technician.

[85] *Report*, "Wounded…," 63, 64, 67.

[86] *Ibid*., 3.

includes the new "inward-looking" dimension, and in June 2005, NORAD issued a formal direction for the conduct of this task.

The Aerospace Control occupation currently has one of the most critical manning level problems in the Air Force, a problem with the potential to affect the surveillance mission, particularly the new responsibility of looking inward. While the "inward-looking" mission has yet to be fully defined, NORAD's idea is to affect this mission as required, and not full time. This mission would therefore be responsive to intelligence or other indicators that a threat exists. Regardless of the technical capabilities to affect this mission, there is also a manning resource cost. The CADS can perform the responsibilities of tracking within the CANR area of responsibility on a short term basis, however, if this mission were to be performed on a prolonged basis, they would require additional manning, as tracking and identification responsibilities would multiply exponentially. This additional manning does not exist today in the Aerospace Controller occupation. The CADS is not postured for the "inward-looking" mission.

EQUIPMENT

The CF-18s operational capability has always been associated with defending the country, and 9/11 "provide(s) eloquent witness"[87] to the need to maintain a viable air force capable of defending national and international interests. Right now, the CF-18 is the only platform Canada has with which to intercept and prosecute an aerial terrorist threat.

[87] Lieutenant-Colonel Carl Doyon, "Replacing the CF-18 Hornet: Unmanned Combat Aerial or Joint Strike Fighter," *Canadian Military Journal*, vol. 6 no. 1 (Spring 2005): 34. The CF-18 is forecast to come to the end of its useful life between 2017 and 2020.

Every day, 24 hours a day, there are two CF-18 aircraft on air sovereignty alert in the west, and two in the east. For each pair, there is one aircraft on standby as a spare. If these aircraft are scrambled for one incident, and a second incident arises, CANR will request two more fighters to be tasked from 1 Canadian Air Division, made available from the Squadrons in Cold Lake, Alberta, or in Bagotville, Quebec. While these numbers sound low, this is a large drain on the already limited Air Force resources, as the capacity to generate flying hours today is less than half of what it was in the early 1990s.[88] Coupled with the maintenance and personnel shortfalls, these few aircraft represent a huge tasking.

In 1954, the Royal Canadian Air Force (RCAF) put in service nine squadrons of CF-100 aircraft to guard the ocean and arctic perimeters and the population centres of Canada against the Soviet threat.[89] In 1990 the CF-18 fighter fleet was 125 strong to guard the same areas. Today, there are 104, of which only 80 are in the process of being upgraded, and the number assigned to operational squadrons is actually fixed at 48, or 12 per squadron. The remainder are used for training, testing, or in reserve for maintenance rotation or replacement.[90] Of the 48 aircraft assigned to operations, many of these are also undergoing routine maintenance at any given time, or used for pilot proficiency flying. The ongoing modernization is scheduled for completion by 2009, and will enhance the operational capability through the end of expected lifetime, between 2017

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[88] *Report*, "Wounded…," 67.

[89] Joseph T. Jockel, *No Boundaries Upstairs: Canada, the United States, and the Origins of North American Air Defence, 1945 – 1954,* (Vancouver: University of British Columbia Press, 1987), 91.

[90] *Report*, "Wounded…," 66.

and 2020.[91] There are as yet no firm plans for replacement of the aging CF-18, and the maintenance and proficiency challenges continue.

Prior to the advent of cruise missile technology, "The RCAF based most of its interceptors along the St. Lawrence Valley and the northern shores of the Great Lakes…to concentrate scarce air defence resources around their most populous and industrialized areas."[92] This posture was based on the reasonable strategic assessment that targets of attack would be the US or Canadian industrial heartland, and these intercept assets were really the only direct protection Canadian cities enjoyed during the 1950's.[93] In the later stages of the Cold War, the Canadian Air Force postured to meet the Soviet bomber and cruise missile threat as far north as possible, hence the more outwardly and northerly dispersed main operating bases and forward operating locations. Today, the airborne terrorist threat might arise from within, requiring, one could argue, a more flexible response and similar or greater protection for the same target areas as in the 1950's. This, however, is not the posture possible for the Canadian Air Force, with its only two fighter bases located in Cold Lake and Bagotville.

The total of four fighters on air sovereignty alert with two spares available is not very many. Consider this number of aircraft versus the size of Canada and the amount of airspace to cover. The main operating bases from which the fighters launch are as well situated as possible considering their area of operations, and with adequate intelligence cueing, they can effect a timely response. That said, to complete a mission an air-

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[91] Doyon, "Replacing the CF-18 Hornet…," 34.

[92] Jockel, *No Boundaries…,* 92.

[93] *Ibid*., 121.

refuelling capability is often required, a capability that is also lacking. Canada does possess limited strategic air-to-air-refuelling in the form of two recently converted CC-150T Polaris (A310-300 Airbus) aircraft, and five CC-130T Hercules tankers. However, these assets are scarce and often support Canadian Forces deployed operations. Support from the US for air-to-air refuelling tankers is therefore necessary for the effective employment of aircraft in the Canadian area of operations, and in support of the daily air sovereignty alert mission. The US dedicates two KC-135 tanker aircraft: one based out of Spokane, Washington for western operations; and one based out of Bangor, Maine for eastern operations, with a 24/7 alert posture. Canada depends upon these US assets in support of Canadian CF-18s during Noble Eagle missions.

CANR has few and aging intercept aircraft, personnel shortages that affect maintenance, training and proficiency, and ultimately the mission, and a dependency on US assets for extended missions. Persistence and a very typical "can-do" approach ensure that CANR remains responsive; however the base of assets is fragile.

Thus far this paper has covered the scope of the aerial terrorist threat to Canada and, broadly, the specific resources available to CANR to conduct the mission of "deter, detect, defeat." At this point, how this all comes together to respond to the threat merits a closer look.

RESPONDING TO THE THREAT

The *Defence Plan On-Line* directs that through NORAD, the Canadian Forces must be able to detect, track, and characterize all aerospace threats to Canada, and support operations that intercept and neutralize air threats. As discussed, the threat

spectrum includes traditional (conventional) threats such as cruise missiles, asymmetric threats such as low radar cross section UAVs, general aviation, crop dusters, and even commercial aircraft.[94]

If a hijacking or other airborne anomaly should become evident, CADS will engage directly, coordinating closely with NAVCAN and other relevant agencies. In a peaceful, domestic environment such as Canada, the CANR response to an airborne asymmetric threat is cued either by intelligence or triggered by an unusual airborne incident. Adequate fore-warning of an aerial threat is required to direct appropriate postures with the ultimate intent of having CF-18 aircraft, air-to-air refuelling assets, E3 Airborne Warning and Control System (AWACS) aircraft (if available) and lines of communication established to meet that threat. Ultimately, the ability of air sovereignty alert aircraft to successfully intercept a potentially hostile track of interest in a Noble Eagle scenario is dependant upon the status and posture of air sovereignty alert assets and therefore the amount of intelligence cueing and warning.

INTELLIGENCE TRIGGERS

> The nature of terrorism has been changing steadily since the end of the Cold War. Many factors are driving this change, including the erosion of national borders, the increasing ease of travel, the revolution in technology and the proliferation of weapons of mass destruction. Preventing terrorist activity very much depends on the collection, analysis and dissemination of information and intelligence, and on cooperation between jurisdictions, levels of government and the private sector.[95]

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[94] Vice Chief of Defence Staff, "Defence Plan On-Line," http://www.vcds.dnd.ca/DPOnline/Maine_e.asp; Internet; accessed 13 March 2006. This description is embodied within Defence tasks 2-8-140, 2-8-2251, and 2-1-82.

[95] Excerpt from the *Government Response to the Report of the Special Senate Committee on Security and Intelligence in 1999*, as quoted by LGen (Retd) Mike Jeffery, "The Canadian Forces in the Domestic Security Environment," in David Rudd and David S. McDonough, eds., *Canadian Strategic Forecast 2004: The 'New Security Environment' – is the Canadian Military Up to the Challenge?* (Toronto: Canadian Institute of Strategic Studies, 2004), 78.

Intelligence is a critical weapon in modern warfare, but in the Canadian Forces there is no central intelligence functional authority to coordinate intelligence efforts, nor is there collection doctrine, policy or directives.[96] The *Defence Intelligence Review* completed in 2004 did not find one part of defence intelligence to be adequate, except at the tactical level.[97] This shortfall is acknowledged, however, despite recent recruiting of analysts, there are just not enough personnel to gather all aspects of intelligence on too many parts of the world. New units are being formed to focus on open source intelligence, human intelligence (HUMINT), geomatics, imagery, counter-intelligence and plans. Nevertheless, the capability remains understaffed and under-resourced. As a result, intelligence regarding an aerial terrorist threat, if cued at all, is usually received after the aircraft is airborne. Once a threat is identified, the time required to intercept is based upon the location and readiness status of the interceptor force. The factors and basic physics preclude the coverage of all assets from the limited air bases located within Canada. Therefore, as much time as possible is necessary to effect the appropriate response.

CSIS headquarters in Ottawa supports the Integrated Threat Assessment Centre (ITAC) and a round-the-clock Threat Management Centre, which facilitates increased information-sharing and integrated intelligence analysis. ITAC produces Government of Canada threat assessments, which are distributed within the intelligence community and to relevant first responders, such as law enforcement and the military. The assessments

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[96] *Report*, "Wounded…," 85.

[97] Canada, Department of National Defence, *Defence Intelligence Review: Report to the DCDS*, (20 May 2004), in *Ibid*.

evaluate the probability and potential consequences of threats, allowing policy-makers and first responders to have the information needed to make decisions and take actions that contribute to the safety and security of Canadians.[98] ITAC is a cooperative initiative, composed of representatives from various partner organizations, who contribute the information and expertise of their respective organizations. ITAC also promotes a more integrated international intelligence community by developing liaison arrangements with foreign intelligence organizations, aiming to contribute to both Canadian and international security. However, as noted above, the line of communication for this intelligence to reach the appropriate military response agency, such as CANR, is not always effective. More to the point, the threat assessments are not always specific enough to trigger an active CANR response.

The most common ONE response is triggered by 'watch-list' alerts regarding 'no-fly list' or 'selectee list' passengers on aircraft inbound from overseas. 'No-fly list' and 'selectee list' persons are those with known or suspected terrorist connections. This information is received at the CANR J2 cell in the Winnipeg Air Operations Centre from US sources via the Cheyenne Mountain Operations Centre in NORAD, from Interpol[99] (also usually via NORAD), or from CSIS.

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[98] Canadian Security and Intelligence Service, "Integrated Threat Assessment Centre," http://www.csis-scrs.gc.ca/en/itac/itac.asp; Internet; accessed 5 March 2006. ITAC is a cooperative initiative with partners from various organizations to include: Public Safety and Emergency Preparedness, Canadian Security Intelligence Service, Canada Border Services Agency, Communications Security Establishment, Department of National Defence, Foreign Affairs Canada, Privy Council Office, Transport Canada, Royal Canadian Mounted Police and the Ontario Provincial Police.

[99] Interpol, "Interpol," http://www.Interpol.int/default.asp; Internet; accessed 21 February 2006. Canada is a member country of Interpol. See also Royal Canadian Mounted Police, "Interpol," http://www.rcmp.ca/intpolicing/interpol_e.html; Internet; accessed 21 February 2006.

The Transportation Security Administration (TSA), which is now part of the Department of Homeland Security, is authorized by US law to maintain "watchlists"[100] of names of individuals suspected of posing a risk or air piracy or terrorism, or a threat to airline or passenger safety. The TSA created the watchlist in 1990 "with a list of individuals who have been determined to pose a direct threat to US civil aviation."[101] The TSA now administers the more specific 'no-fly list' and 'selectee list.' These lists identify passengers that require additional airport/airline security measures. A 'no-fly' match requires the air carrier to call a law enforcement officer to detain and question the passenger. In the case of a 'selectee' an 'S' or special mark is printed on the boarding pass and the person receives additional security screening. These measures, however, are not completely effective; in an email dated July 2002, a Federal Bureau of Investigation (FBI) counter-terrorism officer acknowledged that different airlines have different procedures when the passenger's name is similar to one on a watchlist, which explains how inbound aircraft from Europe are reported with no-fly list persons on board. [102]

The FBI also maintains a terrorist watchlist similar to the TSA list. "The FAA has access to both lists and it is they who have typically redirected flights after they have taken off, indicating that the airline access is either untimely, broke, or checks are not

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[100] A "watchlist" is loosely defined as an individual and customizable list of search criteria. Watchlists are created by Internet users to track financial trends and the stock market, breaking news stories, and any number of other topics of concern. Governments around the globe have been creating watchlists predating the Cold war and in earnest since the events of 11 September 2001. *Source Watch*, "Watchlist," http://www.sourcewatch.org/index.php?title=Watchlist; Internet; accessed 25 February 2006.

[101] *Ibid*.

[102] *Electronic Privacy Information Center*, "Documents Show Errors in TSA's 'No-Fly' and 'Selectee' Watch Lists," http://www.epic.org/privacy/airtravel/foia/watchlist_foia_analysis.html; Internet; accessed 25 February 2006.

being performed."[103] Further to this, the Terrorist Tracking and Information Center (TTIC) is also reported as having a multi-agency accessible Terrorist Watch list and this may in fact be the parent list from which the FBI-TSA lists are derived from. The Central Intelligence Agency (CIA) is also reported to contribute information to the master list at TTIC.[104]

Canada also has it's own 'no-fly list' procedures aimed at passengers originating in Canada who pose "an immediate threat to aviation security" and is working with airlines to stop those people from flying.[105] Though airport and airline efforts are limited compared to US efforts because of sensitivities to civil rights and a different legal environment, names are added to the list based on information supplied by CSIS and the Royal Canadian Mounted Police (RCMP), and data is also shared with American and British security officials.[106] All the open source evidence indicates good cooperation in identifying suspicious persons on inbounds to and aircraft originating in North America. However, while US and Canadian procedures are seemingly successful, not all countries or airlines are as effective. Advisories regarding 'no-fly list' passengers on flights inbound the North America continue.

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[103] *Milnet Brief,* "Terrorist Watch Lists, 4/28/2005," http://www.milnet.com/Watch-Lists.html; Internet; accessed 25 February 2006.

[104] *Ibid*.

[105] Transport Minister Jean Lapierre, as quoted by CBC News, "Canada Gets its Own No-Fly List," (5 August 2005), http://www.cbc.ca/story/canada/national/2005/08/05/lapierre-050805.html; Internet; accessed 25 February 2006.

[106] *Ibid*.

AIRBORNE TRIGGERS

Aircraft themselves may trigger an ONE response. A transponder code of 7500, if it is within secondary surveillance radar coverage, indicates an aircraft is being hijacked and prompts a standard response by ATC (NAVCAN) and by the CADS. ATC will immediately communicate with the aircraft to query if the code is intentional. If the pilot confirms squawking code 7500, or if there is no response, ATC will contact Civil Aviation Contingency Operations (CACO), the CADS, and the appropriate airline. CACO also ensures that appropriate personnel and agencies are informed.[107]

Suspicion may also be triggered verbally in communications from the pilot through the use of the word "TRIP". An airborne aircraft subjected to unlawful interference, in addition to squawking code 7500, is expected to notify ATC by suffixing their call sign with the word "TRIP" and subsequently including the phrase "transponder seven five zero zero" in its radio transmission, if of course it is able to contact ATC.[108]

Further to this, ATC will initiate alert procedures is an aircraft inexplicably deviates from its flight planned route, either in altitude or heading, and does not acknowledge or obey ATC instructions. All aircraft entering, passing through or originating from within the internationally recognized air defence identification zone (ADIZ) are required to file a flight plan with either NAVCAN or appropriate agencies (ie. FAA).[109] Likewise, since 9/11, information on all flight-planned flights is made

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[107] NavCanada, *Air Traffic Control…, Ibid.* NAVCAN, in conjunction with Transport Canada, also performs tasks relating to the control of air traffic in the CANR area of responsibility under the provisions of the Emergency Security Control of Air Traffic (ESCAT) plan, the CANR/TC Aircraft Movement Information Service (AMIS) procedural agreements, and the procedures outlined in the Scramble Intercept Recovery (SIR) Arrangement.

[108] *Ibid*.

[109] *Ibid*.

available to the CADS. This information is collected, processed, and disseminated by the NAVCAN Area Control Centres to the CADS system via the Aircraft Movement Information Service (AMIS), and any deviation from the flight planned route or altitude will generate interest. All in all, procedures for alerting CANR to the presence of a potential hijacked aircraft are sound. That said, a rogue airborne object, such as privately owned or rented aircraft, will not necessarily have filed a flight plan, and will likely not offer any hint of hostile intent.

THE AIR FORCE REACTION

After the 9/11 terror attacks, and with the advent of ONE, a more robust response procedure takes place, which includes scrambling air sovereignty alert aircraft. Depending on the flight and the circumstances, such as a 'no-fly list' passenger, the US may not allow the aircraft to enter US airspace if that was the intended flight planned route. Likewise, authorities may want that aircraft turned back to its international point of departure, or intercepted and diverted so that it cannot be used as a weapon of mass destruction, or a smaller weapon of terror. In the case of a flight inbound via the NAR system or Polar air routes; Canada is squarely in the position of buffer zone or trip-wire. It is up to Canada to initiate denial or take intercept action.

Accordingly, Canadian air sovereignty alert aircraft have maintained an immediate response posture since 11 September 2001.[110] NORAD fighters, including CANR air sovereignty alert, have scrambled or diverted from air patrols more than 2,000

[110] RP Immediate means aircraft and pilot are at the highest sustainable response based on alert location and environmental factors. Alert locations on RP Immediate have aircraft ready for a scramble order, with pilots and maintenance personnel readily available in alert facilities, if applicable. Upon scramble order, an increased sense of urgency will be used to minimize scramble time. Actual response times will vary among alert sites, but it is expected that under normal conditions, the time to become airborne should remain less than 15 minutes.

times to respond to possible air threats, and have combined with Airborne Warning and Control System (AWACS) and air-to-air-refuelling aircraft to fly more than 40,000 sorties.[111] Of this total, a significant number of responses involved CANR and Canadian fighter aircraft.

CANR reacts to a Noble Eagle trigger by recalling its Crisis Action Team to the Air Operations Centre, and the CADS will ready the air sovereignty alert aircraft. Depending on the position of the perceived threat, air sovereignty alert aircraft will be given direction by CADS in accordance with standard air defence scramble procedures (airborne order, battle stations, runway alert, or scramble.)[112] Aircraft are expected to become airborne by the airborne order time, or if scrambled, within 15 minutes of the order. At the same time, CANR will coordinate with CONR for use of US air-to-air-refuelling assets if required.

The ability of air sovereignty alert aircraft to successfully prosecute a potential hostile track of interest (TOI) is dependent, as previously described, upon the status and posture of air sovereignty alert assets and the amount of intelligence cueing and warning. Air sovereignty alert aircraft on a readiness posture of immediate within 15 minutes of transit of an assigned vital point area would require a minimum of 40 minutes warning. This accounts for 15 minutes for the air sovereignty alert to launch, approximately 15 minutes transit to the mission area, plus approximately ten minutes to complete the intercept.[113] Clearly, without adequate intelligence or warning, and if the mission area is

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[111] North American Aerospace Defense, "North…"

[112] See footnote 16 for definitions of "battle stations" and "runway alert."

[113] Unclassified excerpt from SUPLAN 3310-02 obtained from 1 Canadian Air Division Aerospace Readiness.

more than 15 minutes flying time (the speed of which if classified), a timely intercept prior to the TOI reaching the vicinity of a vital point or major metropolitan area would not be possible.

Initial emphasis is placed on the mission area of the track of interest that initiated the reaction while monitoring other areas for similar unusual activity. Through combinations of air traffic control communications, communications between the fighters and the TOI, visual identification, and International Civil Aviation Organization (ICAO) visual signals and warning measures procedures, the intent of the aircraft is determined to be hostile or non-hostile. Ideally, an intercept would occur in visual meteorological conditions to enable visual identification of the aircraft and ICAO visual signal procedures. However, poor communications, such as the mission area being outside of CADS communications coverage, and poor visibility, known as instrument meteorological conditions, may affect procedures, ultimately protracting the time taken to determine the intentions of the aircraft.

If, upon successful interception, the TOI responds positively to ICAO visual signals and complies with fighter or air traffic control direction, a divert decision is required. CANR and CADS continue to work with external agencies to identify appropriate divert locations based on operational concerns for both the air sovereignty alert aircraft and the possible civil tracks of interest as well as logistical concerns such as airfield rescue and fire-fighting capabilities and availability of security, customs and law enforcement assets. In determining the divert details, the battle staff also considers routing and destination to ensure the aircraft is kept well away from vital points and major metropolitan centres.

As the scenario unfolds, CANR also coordinates with the Civil Aviation Contingency Operations (CACO) Division. CACO is responsible for civil aviation contingency planning and is the focal point for aviation emergency preparedness activities. The manage and operate a 24 hour per day Aviation Operations Centre; working with the Department of National Defence, Foreign Affairs, the Federal Aviation Administration, Transport Canada Security and other agencies regarding (among other things) hi-jacking or Operation Noble Eagle events.[114] CACO also provides the link to whatever airline may be involved in the incident.

If the TOI is unresponsive or non-compliant, and other visual clues from the cockpit indicate a possibly hostile intent, warning measures may be authorized by Commander CANR in a further attempt to gain compliance of the TOI.[115] Thereafter, it is the decision of the Government of Canada to declare the TOI hostile and to authorize further action.

> Despite NORAD's binational status, the procedures which since (9/11) have been put in place very strikingly leave such authority in exclusively national hands. In US airspace, destruction…can be authorized by either NORAD's Commander-in-Chief…or by the US Air Force generals commanding the Alaskan and continental US NORAD regions. In Canada, … that equivalent authority has not been given the military.[116]

If engagement authority were required in Canada, the decision would be made by the Prime Minister, or by the Minister of National defence acting on behalf of or in

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[114] Transport Canada, "Civil Aviation Contingency Operations (CACO)," http://www.tc.gc.ca/civilaviation/systemsafety/caco/menu.htm; Internet; accessed 4 February 2006. Civil Aviation Contingency Operations (CACO) Division has responsibilities for contingency planning and occurrence reporting in both the national and regional regulatory and operational fields of Civil Aviation, and is the Civil Aviation focal point for emergency preparedness activities.

[115] Details of intercept procedures and warning measures are classified.

[116] Professor Joseph T. Jockel, "After the September Attacks: Four Questions about NORAD's Future," *Canadian Military Journal*, vol. 3, no. 1 (Spring 2002), 12.

consultation with the Prime Minister. Therefore, the amount of time available to alert the Government of Canada of an impending airborne terrorist attack scenario, in addition to successful prosecution of the TOI with a properly authenticated engagement order, may be extremely limited. The Commander CANR recommends engagement parameters, designed to ensure there is no doubt as to the hostile intent of the aircraft, to the Government of Canada. Once these parameters have been met, there is very little time to obtain engagement authority, commit the fighters, and to neutralize the threat. Further to this, it is recognized that the destruction of a civilian aircraft over a metropolitan centre could cause considerable collateral damage and casualties. Thus, every effort is made to obtain a hostile declaration and engagement authority as far away from urban or metropolitan centres as possible. However, given all factors that may affect the response in a typical Noble Eagle scenario, the fighters could conceivably engage the TOI as close as five nautical miles from the vital point, or 50 seconds from impact. Clearly the availability and responsiveness of the Prime Minister or his designated authority is critical to this time-limited Noble Eagle scenario and vital to CANR's effectiveness.

GOVERNMENT COORDINATION

Thankfully, real world Noble Eagle responses have never progressed to a tragic end. The intercepts and diversions have all gone well from the perspective of CANR and NORAD, as most have originated with 'no-fly list' type advisories and had adequate intelligence forewarning. That said, the coordination between CANR, National Defence Headquarters and the Government of Canada has not always been seamless. As an example, often the divert destination is contested by another government agency, such as law enforcement, or by the civilian airline involved.

The standard CANR procedure of diverting aircraft away from vital points may undesirable to the RCMP or Canada Customs as they may not have enough personnel resources at the divert destination to adequately deal with the passenger capacity of a commercial airliner. It has also happened that the divert destination is contested by the airline on the basis of public relations or economic impacts to the company. Typically a commercial airline is unwilling to have their passengers delayed at a location other than a major population centre, and certain uncooperativeness arises. On the surface these challenges seem minor in the context of national security; however, a poor understanding at the Governmental level of the operational and strategic rationale for CANR procedures has resulted in these protestations causing the Government to over-ride CANR.

For example, on 10 April 2005 the US denied KLM Royal Dutch Airlines Flight 685 from Amsterdam to Mexico from entering US airspace as the names of two passengers appeared on the 'no-fly' terrorist list.[117] Canada coordinated the denial with the airline and controlled the aircraft as it was directed to return to Europe. Initially the airline protested the direction to reverse course, and intercept and diversion plans were set in motion. Both divert locations planned by CANR were protested by law enforcement agencies, who suggested to the Government that the Boeing 747 with 278 passengers be allowed to land in Toronto, Canada's largest metropolitan and economic centre. A second example occurred on 3 Jun 2005, Virgin Atlantic Flight 45 from London's Heathrow Airport to New York's John F. Kennedy International Airport

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[117] CNN.com, "US Bars KLM Flight Entry into Airspace" (10 April 2005), http://www.cnn.com/2005/US/04/10/klm.flight/index.html; Internet; accessed 21 March 2006.

emitted a hi-jack signal and was intercepted by Canadian CF-18s.[118] CANR planned for and recommended diversion to Moncton, New Brunswick, or alternatively Stephensville, Newfoundland, on a flight path that would keep the aircraft clear of any vital points or major built up areas. These options were "unacceptable" to the airline, and the flight was eventually diverted to Halifax in contravention of CANR standard procedures.

Both of these examples demonstrate a gap in operational and strategic understanding and coordination between CANR and the other government departments and civil agencies. In both cases the government decisions were influenced more by the law enforcement agencies and a civil airline company than by CANR, whose mission it is to "deter, detect and defeat" airborne terrorist threats. This gap is a critical vulnerability in the effectiveness of CANR. The newly formed Canada Command and its subordinate Regional Joint Task Force Headquarters may be poised to mitigate this vulnerability.

THE ROLE OF CANADA COMMAND

With a view to treating Canada as a single operational area, the Canadian Forces has established six Regional Joint Task Force Headquarters across the country to integrate land, maritime, and air elements. These headquarters are responsive to Canada Command, broadly analogous to NORTHCOM.[119] The basic premise is that CANR will continue with its traditional "strategic" role during Noble Eagle operations, and Canada Command will coordinate assets in the different regions that may be required in support,

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[118] MSNBC, "False Alarm on Flight to New York" (3 June 2005), http://www.msnbc.msn.com/id/8085449/ ; Internet; accessed 21 March 2006.

[119] US NORTHCOM was established in the wake of the 11 September 2001 terrorist attacks to conduct operations to deter, prevent and defeat threats and aggression aimed at the United States, its territories and interests and provide defence support of civil authorities, including consequence management operations, as directed by the President or Secretary of Defense. North American Aerospace Defense, "North…"

contributing to civil-military cooperation (CIMIC). Further to this, Canada Command is envisioned to smooth coordination with the Government of Canada Operations Centre and other government agencies. Canada Command's coordination function with government and civilian assets, enabled at the regional level by the Regional Joint Task Forces, should close the coordination gap between CANR and response agencies at a potential Noble Eagle divert site in situations such as the KLM and Virgin Airlines diversions described previously.

At the national level, the Government Operations Centre is Canada's civilian strategic-level operations centre; the hub of a network of operations centres run by a variety of federal departments and agencies including the RCMP, Health Canada, Foreign Affairs, CSIS and National Defence. The Government Operations Centre also maintains contact with the provinces and territories as well as international partners such as the US and the North Atlantic Treaty Organization (NATO). Operating 24 hours a day, seven days a week, the Government Operations Centre monitors potential threats to the national interest, gathering information from the other operations centres and a wide variety of sources, both open and classified, from around the world.[120] Once the impact on Canada's national interest is assessed, the operations centre verifies, analyzes and distributes the information to the appropriate response organizations in Canada. It can be surmised that close coordination between the Government Operations Centre and Canada Command will result in better intelligence cueing on airborne threats that originate from

[120] Public Safety and Emergency Preparedness Canada, "Government Operations Centre," http://www.psepc-sppcc.gc.ca/index-en.asp; Internet; accessed 27 February 2006. PSEPC is Canada's lead department for public safety, responsible to build and implement national policies for emergency management and national security. PSEPC helps ensure community safety by delivering crime prevention programs and developing federal policies for law enforcement and corrections, and provides advice to the Minister on matters of national security.

within Canada, enabling CANR a more effective response time, however, this function does not yet appear to be defined.

The PSEPC website advertises that this centre "is the operations centre for the entire country, uniting the efforts of all federal departments and agencies during national emergencies."[121] That said, there is no mention of coordination with Canada Command or NORAD, or even the National Defence Coordination Centre (NDCC). In fact, under the rubric of "national security," PSEPC initiatives are categorized as "policy" and "files," to include: policy advice and support, cross-cultural roundtable on security, security certificates and "listed entities," described as a public way to identify a group or individual as being associated with terrorism. Perhaps the connection is assumed, however given the disconnected ground agency responses to Noble Eagle scenarios, it is plausible that the triggers between CANR and the Government Operations Centre are not firing when required, and PSEPC is not yet poised to resolve this problem.

To be sure, the advent of Canada Command and the six Regional Joint Task Force Headquarters, and the renewed interest in cooperation between all government departments for domestic emergency response, may enhance the effectiveness of CANR in response to airborne terrorist threats, however this remains to be seen. The fledgling organizations are undergoing steady training to augment the Noble Eagle response, however thus far the coordination requirements have increased, as there are now more players, and a certain level of confusion has been interjected as these newly formed

[121] *Ibid*.

organizations learn the procedures, capabilities and limitations of CANR and Operation Noble Eagle.[122]

THE POLITICAL INFLUENCES

Regardless of the capabilities to defend against an aerial terrorist attack, the political will to take action plays the most important role in the effectiveness of CANR. In making the decision to prosecute an airborne WMD, such as a civilian airliner, the ultimate authority rests with the Government of Canada. Thus, the lines of communication between CANR and that authority, as previously discussed, are vital. Operational and tactical aspects aside, there are a variety of other influences the Government must consider in the short time prior to engagement authority. While a detailed examination of these influences is outside the scope of this paper, it is worthwhile to note that international and domestic political, economic and social impacts associated with a decision to prosecute an airborne WMD all influence CANRs posture and effectiveness. Regardless, "There can be no greater role, no more important obligation for a government, than the protection and safety of its citizens."[123]

Securing an Open Society: Canada's National Security Policy is a strategic framework and action plan designed to ensure that Canada is prepared for and can respond to current and future threats. The foremost national security interest is to protect Canada, including the physical security of Canadians, including their values and key institutions.[124] Towards this goal, CANR plays a key role in translating the strategy of

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[122] Major Michael O'Driscoll, *Ibid*.

[123] Canada, Privy Council Office, *Securing an Open Society: Canada's National Security Policy,* (Ottawa: Her Majesty the Queen in the Right of Canada, 2004), vii.

[124] *Ibid*., 5

employing force or the threat of force to secure these national policy objectives. If CANR is not postured to respond effectively to this threat, the promises made to Canadians in *Canada's National Security Policy* and in *Canada's International Policy Statement* are not being met.

RESPONSIVENESS - SUMMARY

The Canadian Forces is adapting to a new type of warfare abroad. At home, CANR has also adapted to the post-9/11 realities. However, a credible force must back up realization of the threat at the tactical and operational level. Currently, the hijacked airliner scenario must be close to ideal, with adequate intelligence forewarning, for a successful intercept. Furthermore, the successful diversion or prosecution of an airborne terrorist threat demands an expedient decision from the appropriate authority. This implies the timely availability of that authority, and the understanding and cooperation of other agencies that are involved in the response. This is not always the case. Finally, note that the capability to defend against terrorist cruise missiles has not been discussed within the context of responsiveness. That is simply because there is no capability. CANRs responsiveness is limited.

RISK ASSESSMENT

> The people, values and assets of any society worth living in are worth defending…We simply cannot afford to gamble that everything is going to be okay for use, and those who come after us.[125]

Does it make sense to invest millions of dollars to upgrade defence systems, or is the risk of attack an acceptable one? How much is enough, and how much is too much?

[125] *Report*, "Wounded…," 3.

These are the issues to keep in mind while determining whether CANR is postured to meet the threat. It is really risk management in applying the law of diminishing returns: the consequences of such an attack versus the probability of a 9/11-type scenario happening again. In managing this risk, the effectiveness of the current situation versus the threat can be used to gauge the level of risk.

The measures of effectiveness against the asymmetric threat are quantitatively simple: there have been no aerial terrorist attacks in the CANR area of operations, and all actual Noble Eagle responses have had adequate forewarning and successful intercepts and diversions. These success indicators, that is, the independent subjective measures tied to specific operational or tactical objectives, all contribute to this measure of effectiveness,[126] and imply that the current posture is effective, and therefore, adequate.

However, a negative measure of effectiveness is also difficult to defend. On the one hand, as there have been no attacks it can be argued that the current posture is sufficient and does not need further investment. On the other hand, this can be contested by stating the threat is still pending, and as there hasn't actually been an attack, there is nothing to prove the measure of effectiveness; the vulnerabilities just haven't been exploited yet. Both of these approaches support the argument the current posture is the minimum required in today's threat environment.

CANR was intended to deter, detect and defend against a Cold war enemy with known intentions. It can be concluded that since the Cold War never progressed to nuclear war, a negative measure of effectiveness, then that posture, and the level of effort it consumed, was successful. CANR is now also directed against the asymmetric "enemy

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[126] United States, Warfare Studies Institute, *Joint Air Estimate Planning Handbook,* (Alabama: Maxwell Air Force Base, 2005), 87, 89.

X" with unknown intentions and unknown capabilities. The posture required to defeat an enemy with different objectives is difficult to define. So, without a tangible measure of effectiveness or a concrete threat, it is difficult to determine the right level of defence required.

One way to address this dilemma is through the concept of deterrence, the cornerstone of Cold War defence. For deterrence to be effective, it must be credible and believable. As an American ally in the defence of North America, Canada benefited from the deterrent power of the US nuclear arsenal, and clearly this deterrence was successful during the Cold War, the success indicator being that nuclear war never happened. However, Canada stands a little more alone, so to speak, in the defence against the asymmetric threat, thus must have it's own credible level of deterrence. Therefore, CANR must be adequately postured to provide this deterrence against asymmetric threats. But does deterrence work against terrorists? Certainly terrorists understand that the Air Force will destroy an airborne threat rather than allow a repeat of 9/11. They also understand how to exploit vulnerabilities in defence systems, as they did on 11 September 2001. The deterrence must clearly show these vulnerabilities have been addressed if it is to be effective.

Regardless, a certain level of the terrorist objective is met by the publicity and fear generated when either the fighters destroy the airliner or when it crashes into a vital point. The destruction of an airliner would yield very low casualties compared to the same aircraft crashing into a major metropolitan or urban area in a 9/11-type scenario. However, given the Canadian aversion to even minimal casualties in a theatre of war or military operations other than war, this act would undoubtedly horrify the Canadian

public, even when weighed against the consequences of not acting. Fear of the subsequent political repercussions could therefore preclude a timely and/or effective decision for engagement authority by the Government of Canada. Either way, the resultant public outrage and after effects would achieve the goal of the terrorist organization. Conversely, failure to act and allowing a 9/11-type scenario to culminate would have equally devastating political and economic ramifications, not to mention destructive second-guessing and the requisite judicial and parliamentary commissions.

Another risk to consider is that associated with inaction, and the resultant reaction of the US. The US has a strong intent to establish a North American security perimeter, and will do this in cooperation with Canada, preferably, or without Canada if necessary. If Canada does not act, or by extension is CANR is unable to act, elements of Canadian sovereignty may be ceded to the US. The military must therefore be in a position to apply air power when necessary. Canada is inseparably linked to the US as a "western" country, with strong economic and social ties, as well as being a political ally. According to Dr. James Fergusson, after the ballistic missile defence "no thank you" from the Paul Martin Government, and coupled with the Jean Chretien Government's "no thank you" to participation in the war against Iraq, US officials may well have doubts about Canada's reliability and credibility.[127] While militarily within NORAD, this is not in question; the failure to intercept and prosecute a track of interest would seriously undermine this trust.

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[127] Dr. James Fergusson, "Shall We Dance? The Missile defence Decision, NORAD Renewal, and the Future of Canada-US Defence Relations," *Canadian Military Journal,* vol. 6 no. 2 (Summer 2005), 14.

"Even Mackenzie King, the original Mr. Dithers, promised that no one would be allowed to attack the US from Canadian territory."[128] If Canada fails to uphold this promise, Washington will do what it must to limit the potential that terrorists can use Canada as a base to strike against the US. This is readily apparent when a flight from Europe to the US or Mexico, passing through Canadian airspace and with a "no-fly list" passenger on board is disallowed from entering American airspace. CANR is then handed the responsibility to turn away, divert or intercept the flight. And "If Canada shirks its responsibility to defend itself and help defend North America, the United States will quickly step in and do it for us."[129] In the context of an aerial terrorist threat, what this could deteriorate to is American intercept and prosecution of the threat in Canadian airspace. It would be difficult to entrust the maintenance of Canadian airspace to another government without placing sovereignty in question. As Colonel Paul Black, president of the Royal Canadian Military Institute remarked:

> How Canada defends its territory and its domestic interests in an important element in how other nations relate to Canada. A 'strong' Canada, with an efficient military, secures a measure of respect from other nations.[130]

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[128] John J. Noble, "Defending the United States and Canada, in North America and Abroad," *Policy Options* (May 2006) [journal on-line]; available from http://www.irpp.org/fasttrak/index.htm; Internet; accessed 12 November 2005, 28.

[129] *Report*, "Wounded…," 5.

[130] Colonel Paul F. Black, "A Wake-Up Call for Canada: The Need for a New Military," Royal Canadian Military Institute, Toronto, Spring 2001, 6, in Doyon, "Replacing the CF-18 Hornet…," 13.

In countering the aerial terrorist threat, the deterrence, the defence and the ability to deal with the aftermath must all be effective. The risk of CANR not being effectively postured against the threat is unacceptable. "Canada has an unenviable place on Osama Bin Laden's infamous list of countries to be targeted. We may get lucky. But it's not a bet you'd want to make."[131]

ANALYSIS OF CANR

> Canada and Canadians…are at more risk now of direct attack than they have ever been during the Cold War itself…We've got to start treating Canada as an operational theatre if we're going to have a command and control structure that allows us to be responsive.[132]

CANR is an operational command and control structure, and in fact functions as the Air Component Command for Canada. Accordingly, it is useful to evaluate CANR's posture vis à vis the aerial terrorist threat against the tenets of aerospace power, namely: centralized control and decentralized execution; flexibility and versatility; synergistic effects; persistence; concentration; priority; and, balance.[133] The tenets are assessed as good, average or poor.

As stated earlier, the CANR mission is to continuously provide warning of an aerospace attack, which includes an aerial terrorist threat or rogue cruise missile, and to maintain aerospace control in Canada, to include air sovereignty and appropriate

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[131] *Report*, "Wounded…," 18.

[132] General Rick Hillier, "Setting Our Course: The Way Ahead for Our Canadian Forces," available from http://www.cds.forces.gc.ca/00native/pdf/cds-vision_e.pdf; Internet; accessed 15 June 2005.

[133] United States, United States Air Force, *Air Force Doctrine Document 1: Air Force Basic Doctrine,* (Washington: Secretary of the Air Force: 17 November 2003), 27. This document refers to the tenets as "Tenets of Air and Space Power,' however, Canada has adopted them into the draft Aerospace Doctrine and "Tenets of Aerospace Power."

aerospace defence measures in response to hostile actions against North America or Canadian national objectives. This mission infers the 'Commander's intent' of engaging threats and responding to hostile acts or intent in defence of these interests. The Commander's intent as a corollary protects the integrity of CANR centres of gravity, which are those characteristics, capabilities, or localities from which a nation, an alliance or a military force derives its freedom of action, physical strength, or will to fight.[134] For the purpose of this analysis, the centres of gravity are surmised as, strategically, the continued alliance between Canada and the US; and operationally, the CANR sensor and surveillance systems to include the ability of the CANR Air Operations Centre and the CADS to carry out the Noble Eagle mission.

To aid in applying the tenets of air power to CANR, the discussion points in this paper can be classed as critical capabilities, requirements or vulnerabilities. Certain critical capabilities are considered crucial enablers for the centre of gravity to function as such, and are essential to the accomplishment of the objectives. The Noble Eagle critical capabilities include intelligence, surveillance, and defensive counter air power against the aerial terrorist threat. Further, there are critical requirements – such as the radar, interceptors, air-to-air refuelling, government support, and public support – which are the essential conditions, resources, and means for a critical capability to be fully operational. Lastly, the critical vulnerabilities – such as the radar coverage, communications, and coordination with other government departments and first responders – are critical requirements (or components thereof), which are deficient or vulnerable to neutralization,

[134] North Atlantic Treaty Organization, AJP-01(B) *Allied Joint Doctrine* (Ottawa: Director J7 Doctrine and Standardization, April 2004), Glossary-2.

interdiction, or attack in a manner achieving decisive or significant results, disproportionate to the resources applied.[135]

TENETS OF AEROSPACE POWER

The first tenets to satisfy are those of centralized control and decentralized execution, a duality critical to force effectiveness. Centralized control includes the planning, direction, prioritization, synchronization, integration and deconfliction of aerospace capabilities to achieve the objectives of the Commander.[136] The Commander CANR maintains a broad perspective of the CANR area of responsibility. The CANR Air Operations Centre is the focal point for centralized planning, direction, control, and coordination of air operations. This centralized control allows CANR, supported by the co-located force generating 1 Canadian Air Division, to prioritize the use of limited air assets. Centralized control also establishes a single source for air component guidance, direction, intent and planning to facilitate timely and coordinated execution.[137] This centralized control maximizes CANRs flexibility, insofar as the few air resources allow.

Decentralized execution is the delegation and execution of authority to lower level commanders to achieve effective span of control and to foster disciplined initiative and situational responsiveness. The CANR Commander's intent is clearly articulated for all air defence scenarios, including ONE responses, and the effective execution of air

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[135] Dr. Joe Strange, "Centers of Gravity and Critical Vulnerabilities," *Marine Corps University Perspectives on Warfighting* no. 4, 2nd ed. (Quantico, VA: Marine Corps War College, 1996), ix.

[136] Canada, Department of National Defence, B-GA-400-000/FP-000 (draft) *Canadian Forces Aerospace Doctrine*, (Ottawa: Chief of the Air Staff, 2005), not numbered.

[137] Canada, Aerospace Capabilities Advisory Group, "NOTAM 2015 – Canadian Aerospace Control Branch Strategic Planning Document" (draft), 20 June 2005.

missions is achieved by the aerospace control and warning functions of the CADS, integrated with the air sovereignty alert system. The CADS is the senior tactical element responsible for decentralized execution of defensive counter air functions over Canada, to include the air sovereignty and Noble Eagle missions. With this command and control structure, CANR is a model of centralized control and decentralized execution.

The tenet of centralized control and decentralized execution becomes more difficult for CANR with the involvement of the Government of Canada and other agencies. Operational level decisions to achieve the Commander's intent and the strategic and national objectives can be over-rode at the Governmental level. As an example, the decision to divert an aircraft away from a vital point may be over-ruled on the advice of law enforcement, ignoring the strategic and operational rationale. These conflicting aims fragment the control and planning, and divert the effort and impact, adversely affecting the outcome of the mission. That said, the tenet of centralized control and decentralized execution is assessed as good.

Flexibility and versatility, although often used interchangeably, have distinct meanings in aerospace power. Flexibility allows aerospace forces to exploit mass and manoeuvre simultaneously, and to shift from one objective to another quickly and decisively. Versatility is the ability to employ aerospace power effectively at the strategic, operational, and tactical levels of warfare.[138] CANR Air Operations Centre and the CADS are capable of controlling any number of incidents, in any part of the area of responsibility, provided they have radar and communications coverage and the air assets to meet the threat. CANR maintains a concept of flexible alert, and the air sovereignty

[138] Canada, DND, B-GA-400…, not numbered.

alert aircraft may be deployed to other suitable aerodromes as directed by the Commander CANR. However, given the limited resources, there is little mass to exploit and not much capability for manoeuvre. In the event of simultaneous or even subsequent incidents in the same mission area, it is questionable whether CANR would have enough air assets to successfully prosecute the threats. Furthermore, CANR has limited to nil capability against the extreme threat of cruise missiles. The tenet of flexibility is therefore assessed as poor while the tenet of versatility is assessed as average to poor.

Aerospace power must also produce synergistic effects. A coordinated force can produce effects that exceed the contributions of forces employed individually. While it is hard to imagine the need for the coordinated application of the various elements of air, space and surface forces in a domestic threat scenario, the functions that enable the interception, prosecution, and re-generation of assets all must work in tandem to accomplish the mission. This is another tenet well addressed by CANR, and is therefore assessed as good.

Aerospace power offers a unique form of persistent pressure against an adversary through the continuous conduct of operations against a broad spectrum of targets. Operational persistence, such as it is with the current level of forces dedicated to the ONE mission, is good. However, without persistence in terms of information operations and public affairs to keep a certain level of public threat awareness, the operational persistence is undermined. Likewise, the initiatives and equipment acquisitions that would sustain and perhaps improve persistence are threatened by competing operational, training and fiscal demands, and undermined by personnel shortfalls and aging assets. Persistence is assessed as poor.

Next is the tenet of concentration of purpose, and avoiding dilution of concentration due to high demand. With Canada's limited aerospace power, the demand for them often exceeds the available aircraft. Depending on the operational situation, this runs the risks of failing to achieve the Noble Eagle mission objectives or delaying or diminishing the effect of fielding a credible and responsible defence. Concentration of purpose is assessed as poor.

Aerospace power must also be prioritized, resolving conflicting demands for a finite amount of resources, be they material, monetary or personnel. The danger of being swamped with demands is likely not an issue and the defence of Canada is a number one priority. Unquestionably, CANR operations obey the tenet of priority as it affects concentration. CANR does apply limited resources where they can make the greatest contribution to the most critical current requirement. The tenet of priority is assessed as good.

Finally, aerospace operations must be balanced. CANR must balance opportunity, necessity, effectiveness, efficiency, and the impact on accomplishing the objectives against the associated risk.[139] The available air assets are balanced with respect to their beddown locations in Canada, but there are not nearly enough of these assets. The surveillance assets are postured to detect and interdict a threat originating from outside of North America, not from within, and are not postured effectively against any kind of rogue cruise missile threat. Unless the vulnerabilities such as radar coverage are addressed, the balance of forces is not effective. Furthermore, there is no national air-to-air refuelling dedicated to the CANR mission, and no airborne early warning assets or

[139] *Ibid*.

even strategic airlift for the transport of tactical control radars if required to cover radar holes. These issues prevent CANR from projecting balanced operations, thus, that tenet is assessed as poor.

The definition of aerospace power is the synergistic employment of all air forces to control and exploit the air environment to achieve national security objectives.[140] The tenets of aerospace power are key, and they must be considered as parts to the whole, and all assets that contribute to the CANR mission must be part of the synergistic effect. While perhaps unfair to judge CANRs posture in terms of aerospace power and tenets intended for times of tension and war, Canada is a theatre of operations, and the asymmetric threat can constitute an attack at any given time. As much as CANR satisfies the tenets of aerospace power to some degree, it is limited in its effectiveness by reduced capabilities and critical vulnerabilities on the ground and in the air.

CONCLUSION

The 2005 Defence Policy Statement states, as part of the future tasks for the Canadian Forces, the Air Force will place greater emphasis on protecting Canada, to include: maintaining CF-18 readiness and examining the acquisition of additional radars to provide better coverage of population centres and vital points.[141] It goes on to state that the Canadian Forces will enhance their role in defending the North American continent by: strengthening their ability to counter threats in Canada, especially in terms of monitoring and controlling activity in the air and maritime approaches to Canadian

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[140] *Ibid*.

[141] Canada, *Defence: A Role…,* 19.

territory; and continuing to contribute Canadian aircraft and other assets to the NORAD mission.[142] This is a good start, but words are not enough, especially words that do not completely reveal the dire state of the air surveillance and response situation.

As partner in the bi-national North American Aerospace Defence (NORAD) Agreement, Canada must stand ready with air sovereignty alert aircraft to intercept, divert and if necessary, prosecute airborne objects that threaten Canada or the United States. Even more importantly, Canada has a duty and responsibility to defend its sovereignty and its citizens. In the post 9/11 world, CANR must play a central and credible role against the terrorist threat; however, it is not postured effectively for the mission of deterrence, detection and defeat of airborne terrorist threats.

The threat environment has expanded from a strategic, nuclear, symmetrical threat of bombers and cruise missiles, to a continuing symmetrical threat in addition to an emergent asymmetrical threat, focussed across all domains, borders and agencies. The air breathing threats now run the spectrum from overt military attack to rogue missile attack to aerial terrorism. Inadequate radar surveillance coverage across the expanse of Canada leaves radar holes that can be exploited by aerial terrorism, and most projects or initiatives to address these vulnerabilities will require both huge and unlikely funding commitments or are too far from fruition to qualify as a solution.

The well advertised shortcomings of the Canadian Forces also represent critical vulnerabilities for the Air Force. The intercept assets, systems and infrastructure are aging and scarce, and there are critical shortages of operational and support personnel. The scarce assets that do maintain an immediate response posture require near perfect

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[142] *Ibid*., 23.

intelligence and advance warning to achieve an effective intercept. When levelled against the threat, CANR comes up short and leaves Canada vulnerable to airborne objects intended as weapons of mass destruction.

Furthermore, any effective response also requires interagency coordination at a level not yet seen: RCMP, CSIS, DND, PSEPC, NAVCAN and other national and regional agencies need to cooperate and seamlessly exchange information on potential airborne threats within the Canadian area of operations. As well, misperceptions and inadequacies in strategic and operational synergy further affect the CANR mission and the Government response, resulting in cross purposes during responses to aerial terrorism and endangering Canadian vital points and major metropolitan areas in the process. Canada Command and the Regional Joint Task Force Headquarters may answer this inadequacy; however, this too is yet to be proven. All these influences affect the ability of the Canadian Government and other agencies to respond to a terror attack in accordance with the national objectives defined in *Canada's International Policy Statement* and *National Security Policy*.

With these critical capabilities, requirements and vulnerabilities in mind, an analysis of CANR against the tenets of air power reveals that while the tenets of centralized control and decentralized execution, synergy and priority are good, versatility is barely average, and the remaining tenets of flexibility, persistence, concentration and balance are all assessed as poor. This analysis of CANR as an operational command and control structure illustrates with unfortunate clarity that it is not postured to meet the terrorist threat.

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