

PER ARDUA AD ARCTICUM

The Royal Canadian Air Force in the Arctic and Sub-Arctic

Edward P. Wood



**Edited and introduced by
P. Whitney Lackenbauer**

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The Royal Canadian Air Force in the
Arctic and Sub-Arctic

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Mulroney Institute
St. Francis Xavier University
5005 Chapel Square
Antigonish, Nova Scotia, Canada
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PUBLICATION

Per Ardua ad Arcticum: The Royal Canadian Air Force in the Arctic and Sub-
Arctic / Edward P. Wood, author / P. Whitney Lackenbauer, editor

(Arctic Operational Histories, no. 2)
Issued in electronic and print formats
ISBN (digital): 978-1-7750774-8-0
ISBN (paper): 978-1-7750774-7-3

1. Canada. Canadian Armed Forces—History--20th century. 2. Aeronautics--
Canada, Northern--History. 3. Air pilots--Canada, Northern. 4. Royal
Canadian Air Force--History. 5. Canada, Northern--Strategic aspects. 6. Arctic
regions--Strategic aspects. 7. Canada, Northern—History—20th century. I.
Edward P. Wood, author II. Lackenbauer, P. Whitney Lackenbauer, editor III.
Mulroney Institute of Government, issuing body IV. Per Ardua ad Arcticum:
The Royal Canadian Air Force in the Arctic and Sub-Arctic. V. Series: Arctic
Operational Histories; no.2

Page design and typesetting by Ryan Dean and P. Whitney Lackenbauer
Cover design by P. Whitney Lackenbauer



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MULRONEY INSTITUTE
OF GOVERNMENT

Arctic Operational Histories, no.2
2017

The Arctic Operational Histories

The Arctic Operational Histories seeks to provide context and background to Canada's defence operations and responsibilities in the North by resuscitating important, but forgotten, Canadian Armed Forces (CAF) reports, histories, and defence material from previous generations of Arctic operations.

Since the CAF's reengagement with the Arctic in the early 2000s, experience has demonstrated the continuity of many of the challenges and frictions which dominated operations in decades past. While the platforms and technologies used in previous eras of Arctic operations are very different, the underlying challenges – such as logistics, communications, movement, and sustainment – remain largely the same. Unfortunately, few of the lessons learned by previous generations are available to today's operators. To preserve these lessons and strengthen the CAF's ties to its northern history, this series is reproducing key reports and histories with direct relevance to CAF operations today.

Adam Lajeunesse
Series Editor

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Acknowledgements

I would like to acknowledge the Social Sciences and Humanities Research Council of Canada for its financial support (Insight Grant 435-2015-1140); Professor Peter Kikkert for suggesting this project and copying the original manuscript in Ottawa; to co-op student Armand Naik for transcription assistance (partially subsidized by the University of Waterloo and the Social Sciences and Humanities Research Council of Canada); and to University of Calgary doctoral candidate Ryan Dean for copy editing as well as preparation of the list of acronyms. A special thanks as well to Dr. Adam Lajeunesse, the Irving Shipbuilding Chair in Canadian Arctic Marine Security Policy with the Mulroney Institute of Government at St. Francis Xavier University, for inviting me to publish this work through the Arctic Operational History Series, and to the Department of National Defence - Targeted Engagement Program for funding to facilitate the printing of hard copies. I also wish to recognize that this volume was completed thanks to a sabbatical leave from St. Jerome's University which allowed me to spend the fall 2017 term as Killam Visiting Scholar at the University of Calgary hosted by the Department of History, the Centre for Military, Security, and Strategic Studies (CMSS), and the Calgary Institute of the Humanities.

*P. Whitney Lackenbauer
Bragg Creek, Alberta
December 2017*

INTRODUCTION

P. Whitney Lackenbauer

*Will Canada remember that the Royal Canadian Air Force first removed the veil of secrecy from our treasure-laden Northland to mark the opening of an epoch-making period of development? Or that immeasurable wealth was conserved by aerial forest protection and that invaluable photographic and survey work was accomplished with greater dispatch than was hitherto dreamed possible?*¹

With this quote from a March 1934 editorial in *Canadian Aviation*, Flight Lieutenant Edward P. Wood introduced the “Northern Skytrails” series in the new RCAF service publication *The Roundel* in November 1948. Wood’s goal was to ensure “that the R.C.A.F.’s northern saga *will* be remembered” – a task that he had assumed when the Chief of the Air Staff instructed the Directorate of Intelligence (Air)² to conduct a survey of the air force’s northern operations. The resulting manuscript titled “The Royal Canadian Air Force in the Arctic

¹ F/L E.P. Wood, “Northern Skytrails: The Story of the Work of the R.C.A.F. in Canada’s Arctic and Sub-arctic Part 1,” *The Roundel*, vol. 1, no.1 (November 1948): 28-32. Reproduced as doc. 1 in Richard Goette and P. Whitney Lackenbauer, eds., *Northern Skytrails: Perspectives on the Royal Canadian Air Force in the Arctic from the Pages of The Roundel, 1949-65*, Documents on Canadian Arctic Sovereignty and Security (DCASS) No. 10 (Calgary and Waterloo: Centre for Military, Strategic and Security Studies/Centre on Foreign Policy and Federalism/Arctic Institute of North America, 2017).

² In 1948, the Directorate of intelligence (Air) operated under the Department of Air in Ottawa. The Directorate of Intelligence started to operate in 1941, but in the reorganization of 13 December 13th 1946, all 3 services (Army, Navy and Air Force) were combined and operated together. The RCAF, however, retained the Directorate of Intelligence (Air), which changed name back and forth between Directorate of Intelligence (Air) and Directorate of Air Intelligence—the only one of the three services, to have kept its own directorate of Intelligence. The two other services used the Directorate of Military Intelligence. Department of National Defence, Directorate of History and Heritage (DHH), Fonds 2004/13 - Directorate of Intelligence (Air) fonds, <https://www.archeion.ca/directorate-of-intelligence-air-fonds>.

and Sub-Arctic”³ represents a pioneering overview of the RCAF’s significant but often overlooked role in the opening of the Canadian North. “Several months of research were necessary to dig out and correlate all the available data, but the time and effort expended have been well rewarded,” Wood explained. “The resultant volume contains about 500 typewritten sheets, some 200 of which read like the adventure stories of our childhood.” Partly a compendium of early reports and recollections by “pioneer pilots and crews,” and partly a synthesis of Second World War and early postwar operations in the Arctic and Subarctic, Wood’s manuscript serves as an important foundation for subsequent scholars interested in analyzing the formative periods that he covers.

Defining the parameters of the Arctic and Canada’s North has become a national pastime for academics and government officials.⁴ Whether adopting the Arctic Circle (anything above 66°30’N Latitude), permafrost, indexes of “nordicity,” the traditional territories of northern Indigenous peoples, the boundaries of Canada’s Northern territories (“North of 60”), or another measure, the analyst will pick a definition that allows them to incorporate those areas that meet their political or methodological aims. The historian, however, is more likely to conceptualize “the North” as an evolving concept which has shifted as Canadians have sought to inscribe their evolving sense of “Canadian-ness” on a shifting “frontier.”⁵ Today, the Canadian Armed Forces defines the North as the area encompassing the Sub-Arctic Region and the Arctic Region to include the Arctic Circle and High Arctic. The Arctic Region comprises the land and sea areas north of 60°N latitude, most of which lies within Canada’s three northern territories (with comparatively small portions in northern Quebec/Nunavik and Labrador/Nunatsiavut). The High Arctic is defined as the region above the Arctic Circle. The Sub-Arctic Region is defined as the area between 55-60°N latitude, encompassing what the Royal Commission on Aboriginal Peoples identified as “Mid-North” and including large areas of

³ An original copy is on file at the Department of National Defence (DND), Directorate of History and Heritage (DHH) 2004/13, Directorate of Intelligence (Air) fonds, files 1-2.

⁴ For an introduction, see Amanda Graham, “Indexing the Canadian North: Broadening the Definition,” *Northern Review* 6 (2012): 21-37; and Robert Bone, *The Canadian North: Issues and Challenges*, 5th ed. (Toronto: Oxford University Press, 2016).

⁵ See, for example, Renée Hulan, *Northern Experience and the Myths of Canadian Culture* (Montreal & Kingston: McGill-Queen’s University Press, 2002) and Sherill Grace, *Canada and the Idea of North* (Montreal & Kingston: McGill-Queen’s University Press, 2002).

northern British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, and Quebec that reflect “northern conditions.”⁶ These definitions, while contemporary and utilitarian, serve as an adequate outline to encompass the areas described by Wood in this volume. By these criteria, Canada’s North “represents 40 percent of our country’s overall landmass and two-thirds of our coastline,” the military’s 2010 *Arctic Integrating Concept* notes. “While exercising Canada’s Arctic sovereignty and promoting development in the North are priorities for the Government, operating in this region continues to be a challenge given the harsh climate, large area, sparse population and limited infrastructure.”⁷ These are enduring challenges, as this history makes clear.

Background

Much ink has been spilled on the history of human occupation and exploration in what is now the Canadian North. Inuit, Dene, and other Northern Indigenous groups have lived in the region since “time immemorial.” As hunter-gatherer societies, their use and occupancy of the lands and waters form a core consideration of what is now widely accepted to constitute Canadian sovereignty. By contrast, the European and Euro-Canadian presence has been rather small, episodic, and transient until relatively recently. Apart from short-lived Norse settlements around the turn of the first millenium CE, the earliest European interest in what is now the Canadian North fixated on trying to find a route *through* the region to reach the riches of Asia. The attempts to navigate through the icy labyrinth of islands north of the Canadian mainland from the sixteenth through the nineteenth centuries proved futile, however, and the much-sought after Northwest Passage did not materialize as a feasible commercial frontier. Instead, the fur trade drew both French and English interests further into the northern reaches of the continental mainland.

This economic activity played a pivotal role in forging relationships between Indigenous and Euro-Canadian peoples, eventually supplemented by the presence of missionaries, whalers, policemen, and the sporadic appearance of explorers. The British Royal Navy resumed its quest to establish a Northwest Passage in the nineteenth century, and while the search for Sir John Franklin’s ill-fated 1845 expedition proved the existence of an Arctic maritime route it also demonstrated its lack of utility. After Confederation in 1867, Euro-Canadians

⁶ General W.J. Natynczyk and R. Fonberg, CDS/DM Directive for the DND/CF in Canada’s North, 12 April 2011, 2-3. See also RCAF, Arctic Air Plan (AAP) Update 2015, 13 July 2015, DND file 3350-AAP (A5 CONT PLANS), G-2/8.

⁷ Chief of Force Development, *Arctic Integrating Concept* (Ottawa: DND, 2010), 3.

invested their resources and energies into establishing east-west linkages to consolidate the Dominion of Canada. The northern limits of the young country, inherited from the Hudson's Bay Company in 1870, remained ambiguous, and defining them seemed a remote, future consideration.⁸

Canada inherited whatever rights Great Britain had to the High Arctic in 1880, but governed its northern territories in a "fit of absence of mind" until after the Second World War. The Alaska Boundary Dispute between Canada and the United States suggested, in the minds of Canadians, that not only did the United States cast covetous eyes at Canada's Northern territories but that Britain would sell out our interests to court American goodwill.⁹ The Government of Canada would have to defend its own national interests in the North. The Klondike Gold Rush prompted the first official assertions of authority in the form of the Northwest Mounted Police and a small field force sent to the region around the turn of the twentieth century, but the expansion of official state activity into the region remained modest before the Second World War. Official maritime expeditions into Arctic waters, matched by flag planting and by asserting a Canadian "sector claim" up to the North Pole, were complemented by diplomatic activities to confirm Canadian sovereignty over the islands of Canada's Arctic archipelago.¹⁰

Historian of technology Marionne Cronin notes that "despite the conquest of the poles in the pre-war era, in the interwar years explorers continued to be drawn towards the poles—only now they travelled by air." This had a transformative effect on perceptions of Arctic exploration. "Historians of

⁸ For a sweeping overview, see Shelagh Grant, *Polar Imperative: A History of Arctic Sovereignty in North America* (Vancouver: Douglas & McIntyre, 2011).

⁹ The Alaska Boundary dispute, which was resolved by arbitration in 1903, concerned the boundary between the Alaska panhandle and British Columbia. Britain still handled Canada's foreign affairs at the time and Lord Alverstone, Lord Chief Justice of England, sided with the Americans in drawing a line that was considerably closer to the American position than to the Canadian. This ignited a firestorm of criticism in Canada amongst nationalists who believed that Britain had sacrificed Canadian interests to bolster Anglo-American relations. See John A. Munro, ed., *The Alaska Boundary Dispute* (Toronto: Copp Clark Publishing Company, 1970) and Norman Penlington, *The Alaska Boundary Dispute: A Critical Reappraisal* (Toronto: McGraw-Hill Ryerson, 1972).

¹⁰ On sovereignty in the Canadian Arctic before the Second World War, see Gordon W. Smith, *A Historical and Legal Study of Sovereignty in the Canadian North: Terrestrial Sovereignty, 1870–1939*, ed. P.W. Lackenbauer (Calgary: University of Calgary Press, 2014).

exploration have argued that the introduction of this modern technology raised the explorer far above the perils of the polar ice, thereby eliminating the danger and hardship at the core of heroic exploration narratives,” she observes. “In this argument, the use of aircraft marked the end of the age of heroic exploration.”¹¹ As Cronin notes – and as the stories in Wood’s volume affirm – Arctic exploration in the air age remained perilous and a test of physical and moral character, and the narratives of early aviators who opened the Canadian North helped to reinvent the “heroic” narrative while integrating technology in the creation of cultural landscapes of the Arctic.

The Air Force and the Opening of the Canadian North in the Interwar Period

The twentieth century advance into the Arctic owes more to the aeroplane than any other factor.

-- Terence Armstrong, (1958)¹²

Historians have thoroughly documented the origins of Canadian aviation and the first applications of air power. During the First World War, Canadian aviators served in seven separate “air forces.”¹³ Both the Canadian Air Force (CAF) and Royal Canadian Naval Air Service (RCNAS) disbanded at war’s end, but the Canadian government authorized a “new” Canadian Air Force (CAF) in February 1920 as a part-time air militia to provide refresher training for former

¹¹ Marionne Cronin, “Polar Horizons: Images of the Arctic in Accounts of Amundsen’s Polar Aviation Expeditions,” *Scientia Canadensis: Canadian Journal of the History of Science, Technology and Medicine* 33/2 (2010): 99-120. See also Cronin, “The Landscape of Exploration: Renegotiating images of the Arctic in the age of polar exploration,” in *Northscapes: History, Technology, and the Making of Northern Environments*, ed. Dolly Jørgensen and Sverker Sörlin (Vancouver: UBC Press, 2013), 57-83.

¹² Terence Armstrong, *The Russians in the Arctic: Aspects of Soviet Exploration and Exploitation of the Far North, 1937-57* (Fair Lawn, NJ: Essential Books, 1958), 62.

¹³ Canadian Aviation Corps (1914), Royal Flying Corps (1914-1918), Royal Naval Air Service (1914-1918), Royal Flying Corps Canada (1917-1918), Royal Air Force (1918), Canadian Air Force (1918-1919) and Royal Canadian Naval Air Service (1918). See S.F. Wise, *Canadian Airmen and the First World War: The Official History of the Royal Canadian Air Force, volume I* (Toronto: University of Toronto Press and the Department of National Defence, 1980).

wartime pilots. A Permanent Force of 307 personnel was approved in 1922-23, becoming the Royal Canadian Air Force (RCAF) on 1 April 1924.¹⁴

The first chapter of Wood's manuscript provides background on the RCAF, "from its hesitant beginnings to its honoured and established position" amongst the world's air forces in the immediate aftermath of the Second World War. With the RCAF functioning as the "government flying service" during the interwar years, the official history notes that RCAF airmen were practically employed as "bush pilots in uniform."¹⁵ Although fiscal realities constrained operations during the Great Depression, the RCAF was elevated to the same status as the Royal Canadian Navy and Canadian Army in 1938.

With this general framework in place, Wood furnishes detailed descriptions of when, why, and how the RCAF became heavily involved in Canadian government efforts to explore and "open" northern regions in the interwar years. As historian Jonathan Vance explains, Canada seemed a country naturally designed to benefit from aviation:

For centuries, explorers, trappers, merchants, settlers and politicians had struggled against the sheer distances involved. Now, these struggles were over. The airplane would shrink the country, collapsing time and space so that the remotest regions were accessible. Using the techniques of aerial mapping and photography ... the resource wealth of the nation could be exploited by the lumberjack and the prospector. Aviation would

¹⁴ On the early post-First World War Air Force, see also Randall Wakelam, "Forging the RCAF: Sword or Ploughshare?" *Canadian Defence Quarterly* 25: 1 (September 1995). See Desmond Morton, "A Non-Operational Air Force: The RCAF 1924-1931," in W.A. March, ed., *Sic Itur Ad Astra: Canadian Aerospace Power Studies, Volume 3, Combat if Necessary, But Not Necessarily Combat* (Trenton: Canadian Forces Aerospace Warfare Centre, 2011). On the development of the RCAF during the late 1920s and 1930s, see Norman Hilmer, "The RCAF in 1927," *High Flight* 2:3 (May-June 1982); Carl A. Christie, "The Royal Canadian Air Force and the Road to War," in W.A. March, ed., *Sic Itur Ad Astra: Canadian Aerospace Power Studies, Volume 2, Big Sky, Little Air Force* (Trenton: Canadian Forces Aerospace Warfare Centre, 2009); William J. McAndrew, "Canadian Defence Planning between the Wars: The Royal Canadian Air Force Comes of Age," *Canadian Military History* 22:1 (Winter 2013).

¹⁵ W.A.B. Douglas, *The Creation of a National Air Force: The Official History of the Royal Canadian Air Force Volume II* (Toronto: University of Toronto Press and the Department of National Defence, 1986), Chapters 2 and 3.

allow Canada to realize its dream of opening the North, the last frontier. But this economic revolution carried with it an even more fundamental revolution. Not only would the economy be changed, but the very nature of time and space would also be altered. New phrases in the vernacular – the devastation of distance, the annihilation of time – became watchwords of an era in which technology was redrawing the map.¹⁶

While often overshadowed by the exploits of bush pilots who opened the Canadian North, Wood's book charts how the Air Force contributed to northern exploration. Chapter two provides a detailed description of Sub-Arctic operations during the interwar years, when the RCAF made its first forays into the North as an agent of national development. The contributions of the Civil Government Air Operations (CGAO) division, largely in support of the Department of the Interior, fit with what today is known as Whole of Government approaches. Wood describes the varied work conducted from air stations (such as Victoria Beach, The Pas, and Norway House, Manitoba), from forest patrolling (the mainstay of air force civil flying operations during the interwar period), to transporting surveyors and Indian agents¹⁷ to remote outposts, to conducting medical missions, to aerial photographing. The latter "all but revolutionized map-making in Canada," the RCAF official history later observed. "For the first time it was feasible to map systematically the whole of the Canadian land mass."¹⁸ Although the Northern Indigenous economy

¹⁶ Jonathan Vance, *High Flight: Aviation and the Canadian Imagination* (Toronto: Penguin, 2002), 134-35.

¹⁷ The delivery of services to Inuit and other Northern Indigenous groups remained minimal during this era, with the government preferring to leave responsibilities for welfare and education to the Hudson's Bay Company and missionaries, and only half-heartedly resourcing assimilationist programs such as residential schools in its Northern Territories. Instead, the prevailing logic that Indigenous peoples were "best left as Indians" prevailed until after the Second World War. See, for example, Ken Coates, *Best Left as Indians: Native-White Relations in the Yukon Territory, 1840-1973* (Kingston & Montreal: McGill-Queen's University Press, 1991) and William R. Morrison, "Canadian Sovereignty and the Inuit of the Central and Eastern Arctic," *Études/Inuit/Studies* (1986): 245-259.

¹⁸ Douglas, *Creation of a National Air Force*, 101. See also Jack Hunter, "Flying in the Prewar RCAF," *Canadian Aviation Historical Society Journal* (Spring 1991): 12-22; and Alex Milne, "Pioneer Survey Flights in Northern Manitoba and Saskatchewan," *Canadian Aviation Historical Society Journal*, 24, no. 1 (Spring 1984): 3-11.

remained rooted in subsistence hunting and the fur trade, discoveries of oil, gold, and pitchblend (the mineral from which radium is extracted) prompted the emergence of a mining economy for non-Indigenous Canadians in the Northwest Territories after the First World War. Aerial surveys, used for cartography and for cataloguing natural resources, played a pivotal role in facilitating resource development in northern regions. “There is no country where aerial transport is destined to be a greater utility than with us in Canada,” Stephen Leacock predicted. “Our vast distances invite it. Our unexplored territory demands it. And our undiscovered mineral wealth warrants it and will pay for it.”¹⁹

The remainder of chapter two reproduces various reports by RCAF personnel on specific activities. The first, E.G. Fullerton’s account of his Mackenzie River flight of 1920-21, is included as a “classic report on the resourcefulness of pioneer pilots and crews” – even though Fullerton had not rejoined the RCAF at the time of this expedition. The next report, by Sandy Macdonald, describes the 1931 photographic survey of the western coast of Hudson Bay (the Kivalliq region of Nunavut today). The next two accounts (by Flight Lieutenant Sheldon Coleman and Air Commodore L.E. Wray) discuss the 1936 Barrens Land Expedition, which involved an inspection trip of Indian Reserves, mining sites, and communities in the Provincial Prairie norths and the NWT, and culminated in getting “lost in the barrens.” Air Commodore A.D. Ross describes RCAF support to the Topographical Surveys Branch in northern Manitoba and Saskatchewan in 1929 and 1930, as well as Newfoundland and Labrador in 1940. Squadron Leader P.E. Sorenson provides an overview of a meteorological survey in the NWT in 1936-7. Air Commodore R.C. Gordon describes activities in the NWT and the northern Prairie provinces out of the Cormorant Lake sub-station in northern Manitoba that he commanded: Operation “Cosmic” (in support of scientific research on cosmic rays) in 1932; photographic operations in 1934 and 1935; and Operation “RCMP” in 1936 which flew the Royal Canadian Mounted Police (RCMP) commissioner on an inspection tour of RCMP detachments in 1936. Group Captain C.L. Trecarten also explains the photographic and geodetic survey of 1934 around Great Bear Lake and the Mackenzie River (searching for a route to supply the Eldorado mine), as well as work in the Nahanni River valley. Finally, Group Captain V.H. Patriarche describes his work as a commercial bush pilot, with particular emphasis on the NAME Coppermine Expedition of 1929-30.

¹⁹ Leacock, quoted in Vance, *High Flight*, 138.

Wood's selection of accounts in chapter two reinforces the blurring of lines between the air force and civilian operations during the interwar period. In summary, the RCAF official history noted that:

civil operations were visible, productive, and personally satisfying. Beyond this, they were the means by which a generation of officers and airmen learned their craft as commanders, staff officers, pilots, mechanics, storemen, and photographers. Advancing technology rapidly made their aircraft and equipment obsolete, but their experience taught them to handle adversity and improvise in unfamiliar circumstances which could not be foreseen in any training manual. The indispensable military virtues – endurance, flexibility, determination, self-discipline, technical proficiency, professionalism – were nurtured in Canada's remote regions.²⁰

Not only did these operations open up significant parts of the Canadian North to development and more regular government services, they also paralleled the evolution of the RCAF into a "military" air force.

Chapter three focuses on Arctic operations in the interwar period.²¹ While Wood acknowledges that the pre-Second World War "activities of the RCAF in the true Arctic were of a very limited nature," the activities to survey aviation possibilities in the Arctic archipelago by Squadron Leader R.A. Logan in 1922 and the Hudson Strait Expedition of 1927-28 provided the RCAF with its first Arctic flying experience when it deployed six aircraft into Hudson Strait area to conduct an aerial survey in support of plans to open Churchill as an ocean shipping port.²² Excerpting heavily from the official reports, Wood's chapter offers a solid introduction to these pioneering Arctic operations.²³

²⁰ Douglas, *Creation of a National Air Force*, 118.

²¹ At the end of the Great War, the Government of Canada's attention again turned to the unresolved issue of sovereignty over the islands of the Eastern Arctic. See Gordon W. Smith, *A Historical and Legal Study of Sovereignty in the Canadian North, 1870-1942*, ed. P. Whitney Lackenbauer (Calgary: University of Calgary Press, 2014); Janice Cavell and Jeff Noakes, *Acts of Occupation: Canada and Arctic Sovereignty, 1918-25* (Vancouver: UBC Press, 2010); and Janice Cavell, "Sector claims and counter-claims: Joseph Elzéar Bernier, the Canadian government, and Arctic sovereignty, 1898-1934," *Polar Record* 50/3 (July 2014): 293-310.

²² See also P. Whitney Lackenbauer and K.C. Eyre, *Unfurling the Air Force Ensign in the Canadian Arctic: The 1922 Eastern Arctic and 1927-28 Hudson Strait Expeditions*, Documents on Canadian Arctic Sovereignty and Security (DCASS)

The Department of the Interior approached the Air Board to send an aviation expert on the 1922 Canadian Arctic Expedition to reconnoitre (without a plane) and discern the feasibility of operating aircraft in the Arctic. Squadron Leader Robert A. Logan's comprehensive report painted a detailed picture of the conditions in Canada's Arctic Archipelago, conceptualized what contributions aircraft could make to northern development, and recommended which airframes could withstand the severe environment. It also anticipated a rivalry with the Soviet Union that would bring Canada's North into strategic equations like never before:

Much has been said of the possibility of future hordes of Slavs overrunning Europe and the great use of aircraft which would be certain in such an event. Aircraft operated from Arctic or Sub-Arctic bases which would swoop down and leave trails of destruction throughout the rest of the world, but from the very nature of their bases of operation they would be almost [inaccessible] for aircraft of countries to which "Cold Weather" flying was unfamiliar, and it is generally agreed that the best method of defence from aircraft is to destroy the enemy's aircraft before it leaves its own borders. Whether war with such a country as Russia would ever come or not should not affect the determination to develop flying in the Canadian Arctic and Sub-Arctic regions because Canada, if it considers itself worthy to be called a Nation, should have enough pride and spirit to take at least ordinary precautions and be prepared to defend herself in any emergency.

Indeed, the High Arctic air exploration role that Logan envisioned for the Canadian Air Force did not begin to develop seriously until after the end of the Second World War.

Although the Royal Canadian Air Force (with the royal prefix added in 1924) did not act on the main recommendations of Logan's study, concentrating instead on forestry and photo work in subarctic and southern

No. 3 (Calgary and Waterloo: Centre for Military and Strategic Studies/Centre on Foreign Policy and Federalism, 2015).

²³ See also P. Whitney Lackenbauer and K.C. Eyre, *Unfurling the Air Force Ensign in the Canadian Arctic: The 1922 Eastern Arctic and 1927-28 Hudson Strait Expeditions*, Documents on Canadian Arctic Sovereignty and Security (DCASS)

No. 3 (Calgary and Waterloo: Centre for Military and Strategic Studies/Centre on Foreign Policy and Federalism, 2015).

regions of the country, it did undertake its first flights north of the mainland of Canada in 1927-28. The main catalyst for the Hudson Strait Expedition was to help discern the feasibility of the Hudson Bay/Strait route to carry Western grain to distant markets. In 1925, the RCAF completed the first flight to Hudson Bay in a float-equipped plane to survey the rail line to Port Nelson.²⁴ The next year air officials cast their sights further north, when work resumed on the rail system that would connect to Churchill, Manitoba and the vast, inland sea of Hudson Bay. In the end, seventeen of the forty-one people involved in the expedition were from the RCAF. Three RCMP constables and three members of the Royal Canadian Corps of Signals also were involved, with the Department of Marine providing the majority of civilians, including four wireless operator-engineers, three storekeepers, three doctors, and three cooks. The RCAF personnel received special air and ground refresher training at Camp Borden in early 1927, with the six aircraft riggers completing special training on the Universal at the Atlantic Aircraft Corporation factory in New Jersey. The intensive training for the participants was “not only in flying but also in meteorology, navigation, engines, first aid, seamanship, snowshoeing, skiing, shooting, dog-handling (this with RCMP instructors), welding, carpentry, rigging, photography and instrument servicing,” historian Hugh Halliday notes. “Attention was paid to emergency supplies and even to the smoking and reading needs of the men who would be living in isolation for sixteen months.”²⁵

The 1927-28 expedition marked the first concerted effort to use aircraft for ice and weather reconnaissance in the Canadian Arctic and produced significant insights into conditions along Hudson Strait. As aviation historian J.K.K. Main observed:

A tougher flying assignment it would have been difficult to find anywhere in Canada. Indeed, few parts of the world have the high winds, intense cold and sporadic, unpredictable open water conditions that can conjure up fog, ice in the air, and impenetrable snowstorms as a local phenomenon, in a matter of minutes.

²⁴ Margaret Carroll, “Defence Forces Operations in Hudson Bay,” in *Science, History and Hudson Bay* vol. 2, ed. C.S. Beals (Ottawa: Department of Energy, Mines and Resources, 1968), 898.

²⁵ Hugh A. Halliday, “Flying the Hudson Strait: Air Force, Part 10,” *Legion Magazine* (1 July 2005), <https://legionmagazine.com/en/2005/07/flying-the-hudson-strait/>.

The long open reaches of the Strait invite and intensify the sweep of Arctic gales along its length. The gales, in turn, tend to keep the ice moving and the water open. Open water in low temperatures induces a heavy, wet fog that clings and freezes to everything, shuts off visibility and eventually turns into a local snowstorm. High winds, fog and wing-icing are the bane of the aviator's life; and the Hudson Strait Expedition was camped on the rim of the cauldron that brewed them all.

This would not bother the high-flying aircraft of today, but the limited performance and open pilot cockpits of that period made the life of the pilot uncomfortable at best and hazardous at all times.²⁶

On four occasions aircraft were lost or forced down, placing crews in danger. Wood provides a detailed summary of Flying Officer A.A. Lewis's narrative "Adrift on Ice-Floes" which recounts his observations about Port Burwell (Killinek/Killiniq) off the northern tip of Labrador, as well as his harrowing experiences after being forced to land on the sea ice in hurricane-like blizzard conditions during a routine patrol on 17 February 1928. With no sense of whether they had landed in the Atlantic Ocean or in Ungava Bay, Lewis, his Flight Sergeant N.C. Terry, and their Inuit guide Bobby stayed alive by building igloos and relying on their air force survival kit as they walked westward over the next seven days. After shooting a walrus to replenish their dwindling supplies, they had to cross open water on three occasions – the last on an ice-pan when their guide abandoned their rubber boat so that he could carry more walrus meat. When they finally reached the coast, they headed north for four days before meeting an Inuit family who led the trio (suffering badly from hunger and exposure) to their village. They reached Port Burwell on 1 March. "Other than frostbite," the RCAF official history noted, "Lewis and Terry suffered no lasting injury."²⁷

The Hudson Strait Expedition answered the three questions originally posed. As Main observed, it produced systematic, reliable data on when heavy ice appeared and disappeared in the strait, when skis and pontoons could be used, and on "non-flying" periods. Photographs documented ice conditions in different parts of the Strait throughout the year. More generally, "the experience gathered about flying conditions along the Strait gave an emphatic 'No' to the question relating to its suitability as a base or line of bases for air operations. No

²⁶ Main, *Voyageurs of the Air*, 81.

²⁷ Douglas, *Creation of a National Air Force*, 111.

more was heard of the proposal to use aircraft to guide ships through the Strait.”²⁸ Nevertheless, the expedition made important contributions to the development of the Hudson Bay transportation route, including radio stations that served as aids to navigation for regular icebreaker patrols after 1930, but the “route’s potential remained unrealized,” the RCAF official history noted. “It was not until after the Second World War that interest in the region was revived, and then for strategic rather than economic reasons.”²⁹

By the early 1930s, both military and civilian aircraft had become a fixture of transportation in the Canadian subarctic and Arctic regions. “Aircraft had emerged from the chrysalis stage and were becoming more generally accepted as a means of transportation,” Moira Dunbar and Keith Greenaway observed. “The ‘headline flights’ were still very much in evidence, but the emphasis was now less on achieving ‘firsts’ and more on demonstrating the capabilities of the machine and pioneering possible commercial air routes.”³⁰ The RCAF photographic and survey programme photographed nearly 1.4 million square kilometres within the northern provinces and covering large swaths of the Arctic mainland by 1939. RCAF aircraft ranged up to the Arctic coast in support of other government departments, particularly the RCMP and Indian Affairs; opened up new air and water routes in the Northwest Territories; inspected gasoline and supply caches; and conducted search and rescue operations for downed planes. They did not venture out over the Arctic Archipelago until after the Second World War, however, and the follow up to many of Lawrence’s detailed observations about the unique challenges of operating in the Arctic were left to civilian operators until after the war.

As historian Danielle Metcalfe-Chenail writes in *Polar Winds: A Century of Flying in the North*:

For the rest of the decade work proceeded along similar lines: detachments from Ottawa would start in southern areas as ice went off the waterways – generally in May – and move north. These detachments normally consisted of two aircraft (usually on floats), two pilots, two camera operators/aircraft mechanics, and a

²⁸ Main, *Voyageurs of the Air*, 80-81.

²⁹ Douglas, *Creation of a National Air Force*, 112. Public acknowledgment only came in the 1970s, when the National Film Board production *The Aviators of Hudson Strait* made extensive use of original film footage taken by the expedition’s cameramen. See <https://www.nfb.ca/playlists/unikkausivut-sharing-our-stories/playback/#42>.

³⁰ Dunbar and Greenaway, *Arctic Canada from the Air*, 489-90.

fifth man who remained at the base to service the planes and cook for the Detachment. A Department of Lands and Mines representative would also be part of the crew. While the RCAF personnel had not known what to expect, Flight Lieutenant Wood noted “the men supplied by the Department for this type of work were rugged individuals. They enjoyed their work, seemed to have a great capacity for living among mosquitoes, and ate and slept comparatively little.”³¹

With the outbreak of war in 1939, the RCAF ceased its photo operations in the NWT. “In the decade of operations in unfamiliar and often unforgiving conditions, there had luckily – perhaps surprisingly – been no fatalities or aircraft write-offs,” Metcalfe-Chenail notes. “But there had certainly been some close calls and lessons learned.”³²

Chapter four offers a brief synopsis of the role of commercial aviation in the opening of Northern Canada before the Second World War. Although the subject of this chapter “indicates little or nothing in connection with the activities of the RCAF,” Wood explains, “many of the individuals who played important roles in the development of northern commercial air lines are ex-members of the RCAF whose first taste of northern flying was savoured whilst in the employ of the service.” While the government cut back on its northern aviation activities during the Great Depression owing to more general austerity measures, historian Stephen Bocking observes that:

To some extent, private operators, especially mining companies, picked up the slack. Prospectors became accustomed to examining the land from the air, identifying promising formations, then setting down on a nearby lake, hammer in hand, for closer study. Equipment and techniques continued to evolve - aviation routes linked Yellowknife, Whitehorse, and other northern centers to the south, flights pushed north into the Arctic Islands, and bush pilots accumulated romantic tales of skill and narrow escapes.³³

³¹ Danielle Metcalfe-Chenail, *Polar Winds: A Century of Flying in the North* (St Catharines: Dundurn, 2014), 72.

³² Metcalfe-Chenail, *Polar Winds*, 72.

³³ Stephen Bocking, “A Disciplined Geography: Aviation, Science, and the Cold War in Northern Canada, 1945–1960,” *Technology and Culture* 50, no. 2 (2009), 269.

An extensive literature narrates the important contributions of bush pilots and northern airline operators during the interwar period.³⁴ Despite this activity, Bocking notes, a “veil” still remained over much of Canada’s north. “Aviation facilities were minimal: with few airfields, aircraft usually landed on open water or snow, thus limiting activities during freeze-up and break-up. With flying priorities shaped by economic needs, large areas remained unexplored, especially in the Arctic Islands.” Furthermore, Northern maps remained spotty, with

³⁴ See, for example, Walter Gilbert, *Arctic Pilot: Life and Work on North Canadian Air Routes* (London: Thomas Nelson and Sons, 1940); Main, *Voyageurs of the Air*; Frank H. Ellis, *Canada’s Flying Heritage* (Toronto: University of Toronto Press, 1968); Ellis, “They Opened the North By Air,” *Canadian Geographical Journal* 79, no. 1 (July 1969): 16-23; Larry Milberry, *Aviation in Canada* (Toronto: McGraw Hill Ryerson, 1979); Jeff Wyborn, “Hudson Bay on Skis and Floats,” *Canadian Aviation Historical Society Journal* (Spring 1988): 4-14; Peter Pigott, *Flying Colours: A History of Commercial Aviation in Canada* (Toronto: Douglas & McIntyre, 1997); L.O. (Larry) Carroll, “How I Learned About Bush Flying,” *Canadian Aviation Historical Society Journal* 38, no. 4 (Winter 2000): 124-135, 148-149; Shannon Drew, “Flying in Ground Proximity: Thirteen Case Studies of Aircraft Flight Routes in Canada 1918-1926” (M.A. thesis, Carleton University, 2001); Pat Myers, “Flying Boats to Twin Otters: The Story of Bush Flying in Canada” on *Canada Confederation to Present: An Interactive History of Canada* (CD-ROM, Edmonton: Chinook Multimedia, 2001); Phillip Godsell, *Pilots of the Purple Twilight: The Story of Canada’s Early Bush Flyers* (Calgary: Fifth House, 2002); Paul B. Dilworth, “A Year in the Bush: Some experiences of Gold Mining and Air Transport in the ‘Thirties,’” *Canadian Aviation Historical Society Journal* 40, no.3 (Fall 2002): 100-105; Rex Terpening, *Bent Props and Blow Pots: A Pioneer Remembers Northern Bush Flying* (Madiera Park: Harbour Publications, 2003); Richard Pickering, “The Life of a Bush Pilot,” *Canadian Aviation Historical Society Journal* 39, no. 3 (Fall 2006): 94-103, 111; Archie McMullen, “Flying the Mackenzie: A Few Reflections on Northern Operations during the ’20’s and ’30’s,” *Canadian Aviation Historical Society Journal* 44, no.2 (Summer 2006): 44-53; Marionne Cronin, “Flying the Northern Frontier: The Mackenzie River District and the Emergence of the Canadian Bush Plane, 1929—1937” (unpublished Ph.D. dissertation, University of Toronto, 2006); Cronin, “Northern visions: Aerial surveying and the Canadian mining industry, 1919-1928,” *Technology and Culture* 48, no. 2 (2007): 303-330; Cronin, “Fading Away: Technological Decline in Canadian Aviation,” *Scientia Canadensis* 32, no. 2 (2009): 1-20; and Cronin, “Shaped by the Land: An Envirotechnical History of a Canadian Bush Plane,” in *Ice Blink*, eds. Stephen Bocking and Brad Martin (Calgary: University of Calgary Press, 2017), 103-130.

extensive areas of “either blank spaces or indefinite dotted outlines of rivers, lakes, and even lone stretches of coastline.”³⁵

The “logic of the air” soon drew Canada’s North into the web of American globalism.³⁶ Visionaries like Vilhjalmur Stefansson had long observed how polar air routes offered dramatically shorter distances between parts of Asia, North America, and Europe. “The map of the Northern Hemisphere shows that the Arctic Ocean is a huge Mediterranean,” the explorer told audiences as early as 1916. “It lies between the continents somewhat as the Mediterranean lies between Europe and Africa. In the past it has been an impassable Mediterranean. In the near future, it will not only become passable, but will become a favoured air route between the continents.”³⁷ Wood promoted this message in his own work. “Northern or sub-Arctic Canada is not at the top of the world as much as it is in the middle of the world in an air sense,” he observes. “On the basis of the Azimuthal projection practically all the great circle routes between North America and Europe and Asia cross the Polar regions. Canada thus holds the key to future global routes.”

Chapter five provides a succinct overview of Arctic and Sub-Arctic operations during the Second World War, when these regions assumed a new, practical geostrategic significance. Geographer Trevor Lloyd observed in *Maclean’s* in July 1943 that “the plane’s conquest of time and space is giving new meaning to global geography and is radically changing the pattern of international relations.” He considered the North to be Canada’s “front door to the air world of the future,” with geography and aviation promising the country a central role “on the shore of the Mediterranean of tomorrow” (the Arctic Ocean) and “a place in world affairs out of all proportion to its population and wealth.”³⁸ Much like the British Commonwealth Air Training Plan in southern Canada, the Northwest Staging Route, Northeast Staging (or Crimson) Route,

³⁵ Bocking, “Disciplined Geography,” 270.

³⁶ Jenifer L. Van Vleck, “The ‘Logic of the Air’: Aviation and the Globalism of the American Century,” *New Global Studies* 1:1 (2007).

³⁷ Quoted in Roger E. Bilstein, *Flight Patterns: Trends of Aeronautical Development in the United States* (Athens: University of Georgia Press, 1983), 178. On Stefansson’s visions, see Elmer Plischke, “Trans-Polar Aviation and Jurisdiction over Arctic Airspace,” *American Political Science Review* 37, no.6 (1943): 999-1013; and Richard Diubaldo, *Stefansson and the Canadian Arctic* (Montreal & Kingston: McGill-Queen’s University Press, 1999).

³⁸ Lloyd quoted in Vance, *High Flight*, 247, 279.

and other defence infrastructure in the Canadian North provided footprints for expanded military and civil activity after the war.

The Northwest became an active theatre of operations in 1942, when RCAF units deployed to Alaska to support their American allies during the Aleutian campaign.³⁹ Flying Officer D.F. Griffin noted at the time that, had the Japanese succeeded at Dutch Harbour “and had they not been held in check later, with the help of the Royal Canadian Air Force, the Pacific Coast of the North American continent might some day have been a Japanese province.”⁴⁰ The veracity of such statements aside, this statement exemplified the novelty of facing a direct military threat to North America. Griffin extolled how:

A handful of Canadian pilots first helped hold them in check, and later played a big part in kicking them right out of the Aleutian chain. In so doing, these Canadian youngsters helped write a new page in the history of aviation, for they flew and fought in one of the strangest parts of the world. They braved fog and storm, hardship and appalling isolation. They braved Japanese fire and possibility of capture by the Jap[anese], with all that could mean.... They made the Canada badges on their shoulders stand for something mighty big in the eyes of U.S. soldiers, sailors and fliers with whom they served.⁴¹

While often associated with the Arctic, Griffith reminded readers that the “Aleutians are not in the Arctic at all,” instead extending into the North Pacific Ocean and “pointing like a finger towards Asia.”⁴² Nevertheless, as an extension of Alaska, this 1900-km island chain curving about 1300 to 1600 km south of the Arctic Circle is considered part of the Arctic in American policy because it is “inextricably connected to the waters above the Arctic Circle.”⁴³

³⁹ On the Aleutian campaign, see Galen Perras, *Stepping Stones to Nowhere: The Aleutian Islands, Alaska, and American Military Strategy, 1867-1945* (UBC Press, 2003); and Brian Garfield, *Thousand-Mile War: World War II in Alaska and the Aleutians* (Anchorage: University of Alaska Press, [1969] 1995).

⁴⁰ D.F. Griffin, *First Steps to Tokyo: The Royal Canadian Air Force in the Aleutians* (Toronto: J.M. Dent & Sons, 1944), 2.

⁴¹ Griffin, *First Steps to Tokyo*, 2.

⁴² *Ibid.*, 3.

⁴³ Yereth Rosen, “US strategy for Arctic includes Alaska's Aleutians and Bering Sea,” *Anchorage Daily News*, 31 May 2016.

In his manuscript, Wood summarizes the personal account of Wing Commander Robert Morrow who commanded the Canadian Kitty Hawk Wing attached to Aleutian operation. Morrow offers detailed descriptions of the islands, the bases in Alaska out of which the RCAF operated, and of routine operations. Air transport proved “our big headache,” he explained. “We had no transport aircraft and relied on the U.S. Army.... Certainly any RCAF force should have its own transport to use, abuse and control.” The RCAF’s limited air transport capacity would continue into the postwar period and constrain its ability to support the construction and resupply of various military and civilian installations in the High Arctic. Then, as during the war, Canada was fortunate to have a supportive ally. Writing on the RCAF and the Aleutian campaign, Flying Officer D.F. Griffin noted:

‘How did you get along with the Americans?’ is a question often asked of the men who come down from the Aleutians. The answer is, there was no particular effort. The Canadians didn’t try to get along with the Americans, and vice-versa. As far as all hands were concerned, there was no difference between a Canadian and an American. People somehow expect that definite efforts to ‘get along’ might be made – concessions by each to each. This was not the case. If you got sore at an American you spoke your mind and heard his spoken back to you. You acted towards him as if he were one of your own lads in the service, and he acted towards you as if you were in his own unit. If you wanted to argue, it was strictly a personal matter and no international relations about it.⁴⁴

The RCAF also worked closely with its allies in operating the North Atlantic Ferry Route – a major transport and supply artery developed to ferry short-range aircraft from the United States and Canada to Great Britain. American air squadrons arrived in Newfoundland in early 1941 under the Destroyers for Bases Agreement, and Captain Elliott Roosevelt (the president’s son) made the initial surveys that resulted in construction of airports at Goose Bay, Fort Chimo (now Kuujuaq), Frobisher Bay (Iqaluit), and Padloping Island. The Canadians built three 7,000-foot runways at Goose Bay airport in Labrador by November 1941,⁴⁵ and the route began operations in the spring of 1942. The

⁴⁴ D.F. Griffin, *First Steps to Tokyo: The Royal Canadian Air Force in the Aleutians* (Toronto: J.M. Dent & Sons, 1944), 36.

⁴⁵ On the origins of Goose Bay, see J.N. Cardoulis, *A Friendly Invasion* (St John’s, NL: Breakwater, 1990) and David Bercuson, “SAC vs Sovereignty: The Origins of the Goose Bay Lease, 1946-52,” *Canadian Historical Review* 70, no. 2 (1989): 206-

Crimson Route, which envisaged ferrying aircraft from manufacturing plants in southern California and Seattle over Canada to Greenland using Arctic air routes, led to the construction of several airfields in northern Canada. The route was eventually abandoned in favour of the Mid-Atlantic Route from Florida to the Azores, but it did signal the growing geostrategic importance of the Canadian Arctic and brought the first vestiges of “military modernism” to Inuit in the eastern Canadian Arctic.⁴⁶

The building of the Northwest Staging Route through northern Canada and Alaska was of far greater strategic importance than the Crimson Route, giving the Allies freedom of action to move aircraft from the “arsenal of democracy” in North America to the Soviet Union to sustain air power campaigns against the Axis in other theatres. A series of airfields stretching from northern British Columbia to the Yukon and on to Alaska began to take shape soon after Canada and the United States reached the Ogdensburg agreement in 1940, with Canada seeing its string of airfields as a major contribution to continental defence.⁴⁷

22. As Wood notes, Canada agreed to reconnoitre Labrador, while the United States investigated Greenland and Iceland. American construction crews built the Blue West 1 (BW-1) air base at Narsarsuaq in Greenland, and later the more northerly Blue West 8 at Sondrestrom on the west coast of Greenland and Blue East 2 near Angmagssalik on the eastern coast. On the development of this route, see John D. Carter, “The Air Transport Command,” in *The Army Air Forces in World War II, vol: 7, Services Around the World*, ed. Wesley Frank Craven and James Lea Cate (Washington: Office of Air Force History, 1983), 42, 44–45.

⁴⁶ On the Crimson Route, see Carl Christie, *Ocean Bridge: The History of RAF Ferry Command* (Toronto: University of Toronto Press, 1995). On military modernism in the Canadian Arctic, see Matthew Farish and P. Whitney Lackenbauer, “The Cold War on Canadian Soil: Militarizing a Northern Environment,” *Environmental History* 12/3 (2007), 920–50; Farish and Lackenbauer, “High Modernism in the Arctic: Planning Frobisher Bay and Inuvik,” *Journal of Historical Geography* 35/3 (2009), 517–544; Lackenbauer and Ryan Shackleton, “Inuit-Air Force Relations in the Qikiqtani Region during the Early Cold War” in *De-Icing Required: The Canadian Air Force’s Experience in the Arctic*, ed. P.W. Lackenbauer and W.A. March. (Trenton: Canadian Forces Air Warfare Centre, 2012), 73–94; and Mélanie Gagnon and Iqaluit Elders, *Inuit Recollections on the Military Presence in Iqaluit* (Iqaluit: Nunavut Arctic College, 2002).

⁴⁷ See Stanley Dziuban, *United States Army in World War II: Military Relations Between the United States and Canada, 1939–1945* (Washington: Office of the Chief of Military History, Department of the Army, 1959); Gregory Johnson, “Strategic Necessity of Military Blunder: Another Look at the Decision to Build the Alaska Highway,” in *Three Northern Wartime Projects*, ed. Bob Hesketh (Edmonton:

Along with the subsequent construction of the Alaska Highway and Canol pipelineline, these developments wrought immense change on the region. “These projects were bigger than anything the Canadian North had seen, and it was clear that the bush planes of the 1920s and 1930s were not sufficient for them,” Vance notes. “The large modern aircraft needed to supply the projects, and the American fighters and bombers to be ferried along the route for transfer to Soviet pilots, required modern airfields with radio and meteorological equipment and artificial lighting for use in darkness or inclement weather. The situation demanded not just a lake on which airplanes could take off and land but a modern, urban airport carved out of the wilderness.”⁴⁸ This was transformative, as the editor of *Canadian Aviation* noted at the time. Instead of taking six to seven days to move troops by ship along the Pacific coastline (where the Japanese threat loomed), the Northwest Staging Route meant that “within 24 hours, a powerful striking force of men and aircraft could be mustered from all over the North American continent and swiftly transported to the defense of Alaska.”⁴⁹

As Wood details in this book, the construction of the Northwest Staging Route opened up much more direct routes to and through the far northwestern reaches of Canada. Building and then expanding main airports at Grande Prairie, Fort St. John, Fort Nelson, Watson Lake, and Whitehorse transformed Northern transportation and logistics. With the Americans surging into the region “with fantastic speed during 1942,” Wood notes, the Alaska Highway soon linked the airfields which were now hardened runways and boasted expansive hangars and accommodation buildings. Ancillary projects, such as a connecting road from the Alaska Highway to tidewater at Haines, Alaska, airfields and docking facilities along the Mackenzie River to supply the CANOL Project, a telephone system, and warehouses, dormitories, service facilities, garages, and other such structures, expanded the military footprint even

Canadian Circumpolar Institute, 1996), 18-28; Ken Coates and William R. Morrison, *The Alaska Highway in World War II: The US Army of Occupation in Canada's Northwest* (Norman: University of Oklahoma Press, 1992); P.S. Barry, “‘Punch’ Dickins and the Origin of Canol’s Mackenzie Air Fields,” *Arctic* 32, no. 4 (1979): 366-373; and Stan Cohen’s multi volume history *The Forgotten War: A Pictorial History of World War II in Alaska and Northwestern Canada* (Missoula: Pictorial Histories Publishing, 1981-92).

⁴⁸ Vance, *High Flight*, 279.

⁴⁹ Quoted in Metcalfe-Chenail, *Polar Winds*, 78.

further.⁵⁰ The influx of air crews and support personnel had significant impacts on local communities. The RCAF took over the operation of the route in 1942, and North West Air Command oversaw myriad military and civilian functions during the war.⁵¹ In the end it served as another prime example of bilateral wartime cooperation.⁵² Wood concluded that:

The development of the Staging Route by joint Canadian-American effort is an achievement worthy of pride. This effort, as a means to three objectives, has proved to be a worthy one, as the voluminous delivery of aircraft to Russia was accomplished with an impressive safety record; a springboard for the final offensive against Japan was provided; and a vital link in Transpolar air routes was forged. This last feature has great significance for the future, as air facilities established in this area make safer and shorter the route from San Francisco to Tokyo and make possible a route from London to Tokyo.

Wood's chapter also references several overseas operations by Canadian Coastal Command in Arctic areas. Although the RCAF did not contribute to the Canadian-led evacuation of Spitzbergen (now Svalbard) in 1941,⁵³ Canadians serving in the Royal Air Force participated in ice and meteorological survey flights in the area and also supported Allied convoy operations out of Murmansk and Archangelsk. Wood also describes how RCAF Pilot Officers J.E. Walker and D.L. Ramsay volunteered to serve with an RAF fighter squadron based at Vayenga airfield near Murmansk in 1941. His brief comments on living conditions and food at the Russian barracks are also interesting, with the final notation that the fighter personnel enjoyed much better conditions than did the Canadians who served with coastal command squadrons in Russia.

⁵⁰ Ken S. Coates and William R. Morrison, "'The Army of Occupation': Americans in the Canadian Northwest During World War II," *Journal of the West* 32, no. 4 (October 1993): 9-18.

⁵¹ For contemporary perspectives, see the National Film Board documentaries *Northwest by Air*, dir. James Beveridge and Margaret Perry (1944) and *Look to the North* dir. James Beveridge (1944).

⁵² See Stetson Conn and Byron Fairchild. "The United States and Canada: Elements of Wartime Collaboration," *United States Army in World War II: The Western Hemisphere - The Framework of Hemisphere Defense* (Washington: United States Army, Center of Military History, 1989).

⁵³ See Ryan Dean and P. Whitney Lackenbauer, "Conceiving and Executing Operation Gauntlet: The Allied Raid on Spitzbergen, 1941," *Canadian Military History* 26/2 (Fall 2017): 1-32.

Soon after the end of the Second World War, Canadians realized that the unraveling alliance with the Soviet Union meant the rise of a new great power competitor that could threaten continental security. The most likely path of approach for the Soviet Union's long-range strategic bombers to strike at the North American heartland was over the North Pole, thus making the Canadian North a potential "Arctic Front" in a superpower conflict. As historian Richard Goette explains, "the strategic reasoning for Canada's requirement to deploy forces to the Arctic was also an important facet of developing Arctic "air mindedness"—especially amongst those RCAF personnel who were already stationed or may soon be stationed in Canada's north."⁵⁴ Indeed, after the Second World War the Canadian military in general (and the RCAF in particular) was required to reorient its "geographical" strategic thinking from the traditional east-west threats.⁵⁵

In order to make the Arctic "legible" for southern planners, the Government of Canada would have to commit significant resources to mapping its Northern regions. In 1943 the RCAF carried out a geodetic survey of southern Baffin Island, but it did not complete any further operations in the Arctic Archipelago for the remainder of the war. Two years later, the Royal Air Force carried out a series of long-range experimental navigation flights in the Canadian Arctic using a four-engine Lancaster bomber (*Aries*), with RCAF members joining these flights and subsequently assisting with data analysis. "Although the trips collected valuable information, they did not represent a complete study of the problems of polar navigation, nor did they inspire the RCAF to embrace a greater role in the Arctic" at that time, historian Peter Kikkert notes.⁵⁶ The *Aries* flights did demonstrate the feasibility of transpolar flights by long-range planes,⁵⁷ and the inspiration for further RCAF photo survey operations came soon after the end of the war. Wing Commander J. G. Showler noted in 1960 that:

⁵⁴ Richard Goette, "The Roundel and Building RCAF Arctic Air-Mindedness During the Early Cold War," in *De-Icing Required*, 55-72.

⁵⁵ James Eyars, *In Defence of Canada Vol. III: Peacemaking and Deterrence* (Toronto: University of Toronto Press, 1972), 320-331.

⁵⁶ Peter Kikkert, "Constructing a Role: The Royal Canadian Air Force in the Arctic, 1945-1953," in *De-Icing Required*, 19. See also Ernest Cable, "Air Force: Leader in the Arctic," in *De-Icing Required*, 9.

⁵⁷ Morris Zaslow, *The Northward Expansion of Canada, 1947-1967* (Toronto: McClelland & Stewart, 1988), 325.

When the Second World War ended the air force took up where it had left off in producing the basic data for the mapping of the north country. The war had given the service new and immensely more efficient equipment with which to do the job. Cameras, which could take photographs sweeping from horizon to horizon, were carried in aircraft with increased range, speed and altitude. New navigation equipment, including radar, permitted accurate flying in the uncharted wilderness. With these tools and veterans of the war to operate and maintain them, Canada started the greatest program of aerial survey ever undertaken by any country.⁵⁸

The Canadian government launched “an ambitious northern photography and mapping effort” in 1946 and the Cabinet Defence Committee approved a twenty-year project to map the entire country the following year. “It involved aerial photography (conducted mainly by the RCAF), ground surveys, and development of navigation aids,” Bocking explains. “In 1948, 911,500 square miles were surveyed and photographed; coverage of most of the north was completed as another 1,741,500 square miles were added over the following two years.”⁵⁹ These photo surveys had transformative impact on the Canadian government’s understanding of northern geography. Bernard Woodruff of the Geodetic Service of Canada noted in 1949 that:

[a]erial photography, in one season’s operations, will locate and delineate the topography in far greater detail than would be possible with many years of ground survey. Airborne cameras, working automatically, have produced a pictorial record of northern Canada that covers hundreds of thousands of square

⁵⁸ Wing Commander J. G. Showler, “Pioneers of the North,” *The Roundel* 12, no. 4 (May 1960), reprinted in Goette and Lackenbauer, eds., *Northern Skytrails*, vii.

⁵⁹ Bocking, “Disciplined Geography,” 272. See also R. I. Thomas, “Photographic Operations of the Royal Canadian Air Force,” *Arctic* 3 (1950): 150-65; R.C. McNeill, “Putting Canada on the Map,” *Sentinel* 6:3 (March 1970), 16-19; B.W. Waugh, “Arctic Mapping,” *Sentinel* 6:3 (March 1970), 44; Leslie J. O’Brien and Louis M. Sebert, “Photogrammetry and Federal Topographic Mapping,” in *Mapping a Northern Land: The Survey of Canada, 1947-1994*, ed. Gerald McGrath and Louis Sebert (Montreal and Kingston: McGill-Queen’s University Press, 1999); and Peter Kikkert, “Constructing a Role: The Royal Canadian Air Force in the Arctic, 1945-1953,” in *De-icing Required: The Historical Dimension of the Canadian Air Force’s Experience in the Arctic*, ed. W. March and P.W. Lackenbauer (Ottawa: Canadian Air Force Warfare Centre, 2012), 17-30.

miles, and have enabled the cartographer to show intricate details of lakes and waterways in areas that hitherto were unexplored.⁶⁰

Nevertheless, aerial photography in the Arctic during the 1940s was a difficult job. “No matter how experienced the crew, in these first years the myriad of lakes, channels, rivers and islands coupled with inaccurate charts made locating one’s position and navigating extremely difficult,” Kikkert notes.⁶¹ Wood’s summary of a pilot’s report on the 1946 summer survey in northern Quebec, northern Manitoba, Labrador, and the Northwest Territories provides insight into the information on weather, mapping, navigation, and magnetic deviations that air crews gathered during these operations. “These operations provided a Canadian military presence, helped gather valuable information, and developed RCAF expertise in Arctic photographic operations under arduous conditions,” historian Sean Maloney observes.⁶² They also continued an important nation-building role that the air force had begun in the interwar period. “The mapping of the North carried out by the Royal Canadian Air Force and the Royal Canadian Engineers between 1947 and 1967 provides a classic example of the military establishment in peacetime undertaking projects of national development that required skills relative to military operations,” Ken Eyre explained. “When the state of the art developed to the point where a civil branch of government could take over, and when future operations could be carried on as profitable, but still reasonably economic ventures, the military gave up the role and moved on to other fields.”⁶³

⁶⁰ Bernard J. Woodruff, “Aims and Organization of the Survey Work: Establishing Ground-Control for Mapping from Aerial Photography,” in Nicholas Polunin, *Arctic Unfolding: Experiences and Observations during a Canadian Airborne Expedition in the Arctic* (London: Hutchinson, 1949), 279, quoted in Bocking, “Disciplined Geography,” 273.

⁶¹ Kikkert, “Constructing a Role,”

⁶² Sean Maloney, “Canada’s Arctic Sky Spies: The Director’s Cut,” *Canadian Military Journal* 9, no.1 (2008): 77-78. Maloney notes that, by 1949, three RCAF were involved in photo-mapping the Arctic: 408 and 414 Squadrons, both based out of RCAF Station Rockcliffe in Ottawa and equipped with modified *Lancaster* bombers, and 413 Squadron with support aircraft. 414 Squadron’s *Lancasters* had a vertical photographic capability, while the 408 Squadron aircraft used a tri-camera system that was linked to a short range navigation (SHORAN) system.

⁶³ Kenneth Eyre, “The Military and Nation Building in the Arctic, 1945-1964,” in *Canada and Arctic Sovereignty and Security: Historical Perspectives*, P. Whitney Lackenbauer ed., Calgary Papers in Military and Strategic Studies (Calgary: Centre for Military and Strategic Studies/University of Calgary Press, 2011), 218.

Wood also documents RCAF testing, training, and experimentation in the early Cold War period. He describes the pioneering work of the Winter Test Establishment (WEE) in testing aircraft and equipment under winter conditions, training personnel for Arctic operations, and investigating the effectiveness of weather methods of navigation in the polar regions. He also provides a detailed overview of the RCAF's role in Exercise *Musk Ox*—a landmark “non-tactical exercise” conducted in early 1946 to “study movement and maintenance in differing cold weather conditions” of a mechanized force that would travel 3,000 miles across northern Canada, relying chiefly on air resupply.⁶⁴ During the trip, participants studied techniques of army-air force cooperation under varying conditions of terrain and weather, as well as aspects of northern movement including the use of LORAN (Long Range Aid to Navigation). Wood's summary sheds light on the techniques of air supply, the selection of austere landing strips, clothing requirements, and dietary and healthy considerations for aircrew. While he notes that Musk Ox achieved its goal to “study” mobility in challenging Arctic conditions, its findings confirmed the need for additional research and testing to enable more effective and efficient Arctic operations in the future.⁶⁵

While Musk Ox was a Canadian-led exercise, the RCAF also participated as an observer on United States Army Air Force (USAAF) operations in the Arctic throughout much of 1946. In March, Canadian airmen flew on American B-29 Superfortresses sent to the High Arctic to locate suitable sites for a proposed system of weather stations. As Wood documents, RCAF observers also participated in Operation Nanook, an American naval cruise around the eastern end of the Northwest Passage. At the end of 1946, Canadian airmen became attached to Operation Polaris, a regular air transport service whereby three American B-29s would travel over Canadian territory as they moved between Meeks Field, Iceland and Ladd Field, Alaska. “If American bombers ever had to cross the Polar Regions on a mission against the Soviet Union, their crews

⁶⁴ Ex “Musk-Ox,” DHH, 746.033 (D2).

⁶⁵ On Canadian Army Arctic operations during the early Cold War, see P. Whitney Lackenbauer and Peter Kikkert, *Lessons in Arctic Operations: The Canadian Army Experience, 1945-1956* (Calgary and Waterloo: Centre for Military, Strategic and Security Studies/Centre on Foreign Policy and Federalism/Arctic Institute of North America, 2016); and Lackenbauer, K.C. Eyre, and Kikkert, “Lessons in Arctic Warfare: The Canadian Army Experience, 1945-55,” in *Canadian Armed Forces Arctic Operations, 1945-2015: Historical and Contemporary Lessons Learned*, ed. Lackenbauer and Adam Lajeunesse (Fredericton: Gregg Centre for the Study of War and Society, 2017), 47-104.

required advanced training and their equipment testing in conditions unique to the Arctic,” Kikkert explains. “The Canadians, like their American counterparts, thought that if war broke out the type of experience provided by *Polaris* would be essential.” Operating in such isolated areas was daunting:

These men were flying into an unfamiliar and dangerous environment, which had not yet been fully mapped or even explored, and their logs reflect this feeling of flying into the unknown. In August 1946, for instance, an American B29 went on an extremely long journey of the region when it covered some 3,467 nautical miles in twenty hours and explored some of the most remote and inaccessible parts of the Arctic. In fact, this sortie was the first time anyone had ever seen some of Canada’s Arctic islands in the summer months. The mixed Canadian and American crew noted the inaccurate mapping of the region, that there were more islands than the map showed, and even suggested that Borden Island might actually be two islands. The flight revealed just how little was known about the Canadian Arctic and highlighted the problems caused by inaccurate mapping, unreliable magnetic compasses, and extremely limited meteorological support, all of which created a nightmare for navigators. The environment of the Arctic also frustrated navigators as the weak horizontal magnetic force throughout the region made maintaining a set course difficult.⁶⁶

Although Canada-US collaboration yielded new and valuable information, Canadian officials remained apprehensive about the sovereignty implications of having the Americans actually lead or conduct operations in the Canadian Arctic.⁶⁷ Several scholars cite American zeal to operate and expand their Arctic footprint in the early postwar era as evidence of encroachments on Canadian

⁶⁶ Kikkert, “Constructing a Role,” 20.

⁶⁷ For official perspectives on Arctic sovereignty in the first half of the twentieth century, see Peter Kikkert and P. Whitney Lackenbauer, eds., *Legal Appraisals of Canada’s Arctic Sovereignty: Key Documents, 1904-58*, Documents on Canadian Arctic Sovereignty and Security (DCASS) No. 2 (Calgary and Waterloo: Centre for Military and Strategic Studies/Centre on Foreign Policy and Federalism, 2014) and Janice Cavell, ed., *Documents on Canadian External Relations: The Arctic, 1874-1949* (Ottawa: Global Affairs Canada, 2016).

sovereignty to achieve US security objectives,⁶⁸ while others highlight the close cooperative nature of these joint defence projects.⁶⁹ Whatever the case, RCAF-led operations avoided such controversies. For example, Operation Investigator set out to locate, examine and report on suitable air bases for float and ski operations in the Western Arctic. A Canso Amphibian and two single-engine Norsemen on floats, with eleven personnel “covered a lot of terrain” during the summer of 1947, “including Banks Island, the north coast of Victoria Island, King William Island, the Boothia Peninsula, Holman Island, and Cambridge Bay,” Kikkert summarizes. “Although on a much smaller scale than the operations of their American comrades, this was the first sustained effort by the RCAF to gain flying experience in the area and they did gather a great deal of information.”⁷⁰ Wood provides a detailed overview of ice, weather, and meteorological conditions, shortcomings in maps and communications,

⁶⁸ See, for example, Donald Creighton, *The Forked Road: Canada 1939-1957* (Toronto: McClelland and Stewart, 1976); Grant, *Sovereignty or Security*, and – in a more subtle manner – *Polar Imperative* (Vancouver: Douglas & McIntyre, 2010); and Bernd Horn, “Gateway to Invasion or the Curse of Geography? The Canadian Arctic and the Question of Security, 1939-1999,” in *Forging a Nation: Perspectives on the Canadian Military Experience*, B. Horn ed. (St. Catharines: Vanwell, 2002), 307-334.

⁶⁹ See, for example, David Bercuson, “Continental Defense and Arctic Sovereignty, 1945-50: Solving the Canadian Dilemma,” in *The Cold War and Defense*, Keith Neilson and Ronald G. Haycock eds. (New York: Praeger Publishers, 1990); Elizabeth Elliot-Meisel, *Arctic Diplomacy: Canada and the United States in the Northwest Passage* (New York: Peter Lang, 1998); Lackenbauer, “Right and Honourable”; Ken Coates, P. Whitney Lackenbauer, Bill Morrison, and Greg Poelzer, *Arctic Front: Defending Canada in the Far North* (Toronto: Thomas Allen, 2008); P. Whitney Lackenbauer and Peter Kikkert, “Setting an Arctic Course: Task Force 80 and Canadian Control in the Arctic, 1948,” *The Northern Mariner* 21:4 (October 2011): 327-58; Daniel Heidt, “Clenched in the JAWS of America? Canadian Sovereignty and the Joint Arctic Weather Stations, 1946-1972,” in *Canada and Arctic Sovereignty and Security: Historical Perspectives. Calgary Papers in Military and Strategic Studies*, P. Whitney Lackenbauer ed. (Calgary: Centre for Military and Strategic Studies, 2011), 145-70; and P. Whitney Lackenbauer and Peter Kikkert, “Sovereignty and Security: The Department of External Affairs, the United States, and Arctic Sovereignty, 1945-68,” in *In the National Interest: Canadian Foreign Policy and the Department of Foreign Affairs and International Trade, 1909-2009*, Greg Donaghy and Michael Carroll eds. (Calgary: University of Calgary Press, 2011), 101-20.

⁷⁰ Kikkert, “Constructing a Role,” 20.

potential aerodromes, health and morale, clothing, and access to game. He also paints a portrait of Inuit as friendly, generous, and honest compatriots – “very desirable Canadians [who] are happy and sociable and always ready to share their possessions whatever they may be” – and emphasized the importance of positive Inuit-Air Force relations:

It is the policy of the RCAF to always help the Eskimos, to feed them when they are starving, give medical attention when they are ill or be authorized to transport them to hospitals when necessary. All operations should be briefed to keep relations with them on a high level and help them in every way possible. It is considered that the good will and co-operation of the Eskimos would be a valuable asset to the RCAF in particular, and Canada in general, in any operations which may take place in the Arctic.

The RCAF also resumed its close cooperation with other government departments in the postwar period. With the Magnetic Division of the Department of Mines and Resources it launched Operation Polco, a 1947 mission to establish ground magnetic observation stations and fixes at 14 points in the area of the North Magnetic Pole in the hopes of ascertaining the position of the Pole. Both the pilot and the navigator of the Canso flying boat were decorated for their skills during the operation (as no aids to navigation were available during most of the flights), which corrected various cartographical errors. The successful program continued with RCAF support in subsequent years. “These expeditions embodied the growing cooperation between the RCAF and other departments in the North,” Kikkert notes. “Air Force planners learned the valuable lesson that cooperation with civilian departments already engaged in the Arctic could improve operational success.”⁷¹

Chapter 6 also highlights “peacetime” roles such as search-and-rescue (SAR) and mercy flights (now known as humanitarian missions). “The job may be to look for a missing airliner down at sea, or it may be to put down on a ‘homemade’ landing strip in the Far North to bring out an Eskimo [Inuk] or missionary requiring immediate hospital attention,” Wood noted. During Operation Flip, the RCAF flew in members of the RCMP and Department of Transport to relieve the crew when the government supply ship *Nascopie* struck a reef (and eventually sank) off the coast of Cape Dorset in 1947. The case study of Operation Canon, a mission to try to save the life of Canon Webster who accidentally shot himself at Moffet Inlet (on the northern tip of Baffin Island) in October 1947, reveals the logistical and environmental problems of

⁷¹ Ibid, 24.

deploying and sustaining even a small group of men in the High Arctic.⁷²

Chapter 7 anticipates “future trends” in air activity as these were perceived in 1948. By this point, the geostrategic importance of “great circle routes” in the Arctic was readily apparent. Furthermore, weather services relied upon meteorological data from the High Arctic which required resupply of isolated stations by air. “The need for aviation in the Arctic” was no longer the rallying cry of promoters like Stefansson, but an objective reality for the RCAF. To facilitate safer aviation, the manuscript recommended “opening up the country and populating it to a much greater extent than it is today. Landing grounds of suitable size should be constructed, navigation facilities, including much more accurate maps, should be provided and, indeed, suitable aeroplanes should be developed and built.” Drawing largely upon a report by Wing Commander G.M. Fawcett, Wood identified ongoing aviation problems in the Canadian Arctic related to natural phenomena such as precipitation static, the auroral zone, and the magnetic pole. Once these were better understood, he anticipated, “the Arctic should be almost as safe for aviation as any other part of the world.” Indeed, RCAF navigators continued to develop innovative navigation procedures for polar latitudes⁷³ - a subject beyond the scope of this volume. By 1956, Keith Greenaway and Moira Dunbar would suggest that new technology and navigation techniques “took much of the adventure out of flying the High Arctic. It has become routine, and this is as it should be - and is what the pioneers after all were willing to achieve.”⁷⁴

In his final conclusion, Wood notes that “between the time of S/L Logan’s expedition to Ellesmere Island in 1922 and the present there have been many faltering steps taken and many mistakes made—fortunately very few fatal

⁷² On Operation Canon, see also Maurice Flint, *Operation CANON* (London: Bible Churchmen’s Missionary Society, 1949); Ray Price, *The Howling Arctic* (Toronto: Peter Martin Associates, 1970), 67-77; Hugh Halliday, “Rescue Mission,” *The Beaver* 75:2 (April/May 1995): 14-25; Sandy Babcock, “Operation CANON: A Case Study of Early RCAF Arctic Search and Rescue Capabilities,” in *De-Icing Required*, eds. Lackenbauer and March eds., 31-41; and the official report by Prairie Command Headquarters, “Operation Canon,” in *Canadian Armed Forces Arctic Operations, 1941-2015*, eds. Adam Lajeunesse and P. Whitney Lackenbauer (Fredericton: Gregg Centre for the Study of War and Society, 2017), 132-151.

⁷³ Cable, “Air Force: Leader in the Arctic,” 3. On this topic, see Keith Greenaway and M.D. Gates, *Polar Air Navigation: A Record* (Ottawa: self-published, 2009).

⁷⁴ Keith R. Greenaway and Moira Dunbar, *Arctic Canada from the Air* (Ottawa: Queen’s Printer, 1956), 92.

ones—and the lessons learned from mistakes made have been of enormous value.” Through trial and error, air crews enhanced survival training, maintenance, servicing facilities and operating methods. “This great wealth of experience paved the way for the work which was to follow and were it not for the unfailing courage and determination of these earlier pilots, observers and ground crew, much that has been done would have been impossible.” Wartime advances in Arctic aviation extended both operations and infrastructure northward. In the early postwar period, Wood highlighted:

Now our efforts are turned northward again. It has become increasingly evident that our arctic areas must be developed and protected, and that it is our responsibility. The job is so gigantic that in some instances United States aid has been sought and received.... The greater knowledge gained serves to emphasize the need for still more knowledge of the Arctic, and so the work progresses till the motto of the RCAF might well be, instead of *Per Ardua ad Astra, Per Ardua ad Arcticum*.

* * *

“A new chapter in the story of Canadian transportation is being written by the aeroplane in its development of Northern Canada,” Wood concluded in the late 1940s. “The northern air routes in existence to-day will undoubtedly be links in a global air chain. In this connection it appears certain that few countries have more to gain than Canada in the vast changes which will materialize.”

The Arctic came into its own as a strategic theatre during the Cold War, forcing Canada to balance sovereignty concerns with continental defence imperatives. As superpower rivalry heated up in the 1950s, the Americans led the effort to construct air defence systems to protect the continent’s northern frontiers—or, more precisely, to secure advance warning to protect the deterrent and thus the industrial heartland of North America.⁷⁵ “The ghastly one aircraft, one bomb, one city algebra of the nuclear age made it inevitable” that resources would have to be dedicated in the North,” Eyre observed. “No longer was the North a strategic barrier.” He hastened to add that “neither the United States nor Canada looked on the North as a *place* to be protected because of some

⁷⁵ The essential study on this process remains Joseph Jockel, *No Boundaries Upstairs* (Vancouver: UBC Press, 1987).

intrinsic value. Rather it was seen as a *direction*, as an exposed flank.”⁷⁶ From the Pinetree Line along the 50th parallel to the Mid-Canada Line, a Canadian-funded radar “fence” along the 55th parallel, the warning network extended progressively northward, culminating with the Distant Early Warning (DEW) Line across the seventieth parallel.⁷⁷ Through the binational North American Air (later Aerospace) Defence Command (NORAD), Canada and the United States institutionalized their relationship as “premier partners” in continental air defence. The RCAF learned to deal with the unique and challenging operating conditions in the Arctic, but the type and tempo of its activities (and those of the military more generally) were inextricably linked to political interest in the region, which rose and fell alongside popular perceptions of sovereignty threats.⁷⁸

Since the end of the Cold War, growing concerns about climate change, potential international interest in an increasingly ice-free Northwest Passage, global demands for Arctic resources, and security in the post-9/11 world have since coalesced to put the Arctic back on the national and international agenda. Melting ice and increasing accessibility mean more activity in the Arctic region, conjuring dreams of new transarctic transit routes and of exploitable oil, gas, and minerals to fuel a resource-hungry world. External interest from other Arctic states and a growing throng of non-Arctic players promises to keep it there in the twenty-first century.⁷⁹

Although there is no immediate conventional military threat to Canada’s North, strategic assessments over the last decade emphasize that the Canadian Armed Forces must be prepared to respond to myriad safety and security challenges in an increasingly complex region.⁸⁰ For example, RCAF SAR activities are expected to increase alongside commercial and tourist activities in the Canadian North. Other government departments and agencies rely upon air

⁷⁶ Kenneth Eyre, “Forty Years of Military Activity in the Canadian North, 1947-87,” *Arctic* 40:4 (1987), 294.

⁷⁷ The best overview of continental defence during this era remains Jockel, *No Boundaries Upstairs*.

⁷⁸ See Coates et al, *Arctic Front*; and Lajeunesse and Lackenbauer, eds., *Canadian Armed Forces Arctic Operations*.

⁷⁹ See, for example, Franklyn Griffiths, Rob Huebert, and P. Whitney Lackenbauer, *Canada and the Changing Arctic: Sovereignty, Security and Stewardship* (Waterloo: Wilfrid Laurier University Press, 2011).

⁸⁰ See P. Whitney Lackenbauer and Adam Lajeunesse, “The Canadian Armed Forces in the Arctic: Building Appropriate Capabilities,” *Journal of Military and Strategic Studies*, 16/4 (March 2016): 7-66.

force capabilities to enable and support their responses to safety and security incidents in the region. The air force also continues its longstanding role in supporting routine military operations and exercises in the North, from community-based Canadian Ranger patrols to larger-scale Nanook series operations. Given its reach and flexibility, the RCAF plays a central role in Northern ISR (intelligence, surveillance and reconnaissance) and contributes to domain awareness with other CAF components and its allies. Furthermore, renewed Russian activity in the Arctic serves as an important reminder that the region is not immune to military messaging and competition, and the RCAF plays an important role in defending North American airspace and has the reach, speed, and flexibility to allow the entire defence team to respond to Northern threats and hazards across the mission spectrum.⁸¹

Despite the RCAF's long experience of operating in the Canadian North, environmental and resource challenges remain that constrain both routine and contingency operations. As the updated RCAF Air Arctic Plan (AAP) noted in 2015, "Canada's North is vast with sparse infrastructure, extreme weather and limited resources which are very expensive to replenish. RCAF speed and flexibility are well suited to conduct Northern operations but the harsh physical environment provides significant year round challenges for the conduct and support of RCAF operations in this region."⁸² As today's RCAF develops Arctic basing and infrastructure initiatives to improve its Northern operational effectiveness and reduce risks to personnel and equipment, it may well acknowledge its early challenges in opening up the North to aviation - amply documented by Wood - as well as its important contributions to Northern national development (from mapping to meteorology to community development).

Senior federal civil servant Hugh Keenleyside quipped in October 1949 that "the whole history of the Canadian North can be divided into two periods—before and after the aeroplane."⁸³ Indeed, aviation played a profound role in the

⁸¹ RCAF, Arctic Air Plan (AAP) Update 2015, 13 July 2015, DND f.3350-AAP (A5 CONT PLANS).

⁸² RCAF, AAP Update 2015.

⁸³ Hugh L. Keenleyside, "Recent Developments in the Canadian North," *Canadian Geographic Journal* 39 (1949): 157-76.

making of the “modern” Arctic during and after the Second World War.⁸⁴ As Bocking explains, the polar aviation practiced in the postwar period:

built on two decades of interwar experience. It was also anything but effortless: break-downs, dangerous landings (especially on small, rocky, and unsurveyed lakes), and unpredictable weather demonstrated the persistent challenges of northern aviation. Aviation techniques were perfected through experience with the region’s unique navigational and environmental challenges, even as facilities were constructed that both facilitated and were themselves dependent on aviation. This, and the uneven adoption of aviation itself, demonstrated how this was an instance neither of technological determinism, in which these machines compelled their own adoption, nor of aviation simply responding to demand; rather, aviation helped construct a demand for mobility in the north, while being itself dependent on a supportive institutional environment.⁸⁵

The RCAF’s institutional environment fostered Arctic air mobility, and the air force built “an enviable record of efficient arctic operations” from the interwar period into the Cold War.⁸⁶ The RCAF’s enduring roles of defending Canada and our shared continent, while contributing to international peace and security, will not go away. In performing and supporting a wide range of safety and security tasks, the men and women serving in the RCAF remain critical enablers for Canada to realize its Arctic potential.

In light of the Canadian Armed Forces’ concerted efforts to enhance its Arctic capabilities over the last decade, the RCAF’s 2015 Air Arctic Plan notes the importance of a sustained “Lessons Learned program ... to ensure that every Northern RCAF effort is leveraged to progressively improve the effectiveness and efficiency of Northern RCAF activities.”⁸⁷ This represents an acknowledgment that robust operational knowledge is cumulative, and experiential knowledge derived from routine activities, exercises, and contingency operations should feed into an ongoing process of institutional

⁸⁴ On this process, see Zaslow, *Northward Expansion of Canada*; Grant, *Sovereignty or Security*; and John David Hamilton, *Arctic Revolution: Social Change in the Northwest Territories, 1935-1994* (St Catharines: Dundurn, 1994).

⁸⁵ Bocking, “Disciplined Geography,” 274.

⁸⁶ Moira Dunbar and Keith Greenaway, *Arctic Canada from the Air* (Ottawa: Defence Research Board, 1956), 480.

⁸⁷ RCAF, AAP Update 2015.

learning. Along these lines, in the early postwar period the RCAF directed Wood to produce a historical report that would heighten awareness about major RCAF activities conducted in the North to that time. He begins his final summary with the statement:

On re-reading all that has gone before in this work, the pertinent fact seems to be that the very first thinking on Polar Aviation problems was so incisive and far-seeing that the general views expressed do not differ greatly from the very latest views held to-day. In fact, the Polar Concept, as we know it and regard it as something rather new, was just as real in the mind of [Squadron Leader] R.A. Logan in 1922 as it is real and important in our minds today.

Serialized parts of Wood's manuscript, which appeared as "Northern Skytrails" articles in *The Roundel*, contributed to what historian Richard Goette has identified as the RCAF's attempt to promote and foster a sense of "Arctic air mindedness" in the postwar period. These articles (which have been reprinted in a recent volume in the Documents on Canadian Arctic Sovereignty and Security series⁸⁸) omitted significant detail that appeared in Wood's full report because he doubted that the information would generate much interest beyond a narrow circle of historians and Arctic specialists at that time. That circle of interest has grown over the past seventy years, and we hope that publishing his work as part of the Mulroney Institute's new Arctic Operational History series will make this important resource more readily available to scholars, serving RCAF personnel, aviation buffs, and people interested in the history of Canada's North.

Editor's Note

Research on the Canadian North, polar aviation, state authority and sovereignty in the Arctic, and the opening of the Subarctic and Arctic as a military frontier from the 1920-40s has grown substantially since Wood compiled his study. Rather than trying to intersperse suggested readings in footnotes throughout Wood's text, I have appended a list of further readings. These are intended to provide readers with a sampling of recent scholarship to supplement the broad themes and topics covered in Wood's manuscript.

As editor, I have changed to italics some of the names and phrases that he placed in quotes, as well as corrected the occasional typographical error. Overall,

⁸⁸ Goette and Lackenbauer, eds., *Northern Skytrails*.

however, the text is published here as it was written in 1948. This means that some words and phrases that are now seen as degrading – such as Eskimos for Inuit, Indians for First Nations, and Japs for Japanese – are present in the text. To replace them with contemporary terms would not be reflective of the era and the mindsets in which Wood and the various individuals who contributed stories about their operational experiences. Accordingly, readers are encouraged to consider the historical contexts in which these viewpoints were expressed.

I have chosen not to include various biographical sketches, which Wood had placed as an appendix at the end of his manuscript, in this book as they are outdated and, in several cases, describe individuals who are not referenced in the manuscript itself. Readers interested in these biographies can access them in DHH 2004/13 file 1.

List of Acronyms

A.A.A.F	Auxiliary Active Air Force
A.S.L.	Above Sea Level
A/C	Air Commodore
A/V/M	Air Vice-Marshall
Astro	astronavigation/celestial navigation
ATC	Air traffic control
B-17	Boeing “Flying Fortress” heavy bomber
B-24	Consolidated “Liberator” heavy bomber
B-25	North American “Mitchell” medium bomber
B-26	Martin “Marauder” medium bomber
B-29	Boeing “Super Fortress” heavy bomber
BCATP	British Commonwealth Air Training
BR	Bomber-Reconnaissance
B.S.A.	Birmingham Small Arms
C.A.F.	Canadian Armed Forces
Capt.	Captain
CAVU	Ceiling and Visibility Unlimited
CG4A	Waco “Hadrian” glider
C.G.S	Coast Guard Ship
C.G.A.O	Civil Government Air Operations
C.P.A.	Canadian Pacific Air Lines
Cpl.	Corporal
CRWPC	Canadian Radio Wave Propagation Committee
DF	Direction Finding
DFC	Distinguished Flying Cross
D.L.S.	Dominion Land Survey
DMS	Dimethyl sulfide
D.O.T.	Department of Transport
D.R.	Dead reckoning
D.H. 9a	Airco light bomber
DZ	Drop zone
EAC	Engineers Aircraft Corporation folding-parasol wing aircraft
E.D.T.	Eastern Daylight Time
F.3	Felixstowe flying boat
FC.2	Fairchild utility aircraft
F/L	Flight Lieutenant

F/O	Flying Officer
F/S(gt)	Flight Sargent
G/C	Group Captain
HBC	Hudson's Bay Company
H.Q.	Headquarters
H.S.2L	Curtiss Coastal Patrol Boat
JSCGC	Joint Command and General Staff Course
LCM	landing craft mechanized
LCP	landing craft personnel
M.B.E.	Order of the British Empire
M.P.H.	miles per hour
N.A.R.	Northern Alberta Railway
N.C.O.	Non-commissioned Officer
No(s).	Number(s)
NPAAF	Non-Permanent Active Air Force
O.C.	Officer Commanding
P-38	Lockheed Lightning fighter
P.A.A.F.	Permanent Active Air Force
R.A.F.	Royal Air Force
RCAF	Royal Canadian Air Force
R.C.M.P.	Royal Canadian Mounted Police
RFC	Royal Flying Corps
RNWMP	Royal North-West Mounted Police
ROCS	Receiver Operating Characteristic Signal
S.E. 5	Scout Experimental 5 (Royal Aircraft Factory)
S/L	Squadron Leader
WO	Warrant Officer
W/T	Wireless Telegraphy



Edward P. [Poyntz] “Eep” Wood (1918-2000)

THE ROYAL CANADIAN AIR FORCE IN THE ARCTIC AND SUB-ARCTIC

Edward P. Wood

Foreword

This document was produced with the authority of the Chief of the Air Staff to provide a record of the activities of the Royal Canadian Air Force (RCAF) in the Arctic and Sub-Arctic, since its inception up to the present. The task was assigned to the Directorate of Intelligence (Air).

When first assigned to compile material for the work and experiences of the RCAF in the Arctic and Sub-Arctic, it must be confessed that the writer was somewhat at a loss as to the definite limits of these two regions, but he was assured that he was not alone in his ignorance, and in fact was informed by authoritative sources that the limits of the Arctic and Sub-Arctic is something of a bone of contention among students of Polar lore. However, it was decided to use those limits laid down by Trewartha 1937, including Köppen's classes *Dfc*, *Dwc*, and *Dwd*.¹

¹ *Editor's note:* The Köppen climate classification is one of the most widely used climate classification systems. *Dfc* refers to subarctic climate: the coldest month averaging below 0°C and 1–3 months averaging above 10°C. *Dwc* refers to Monsoon-influenced subarctic climate: the same temperatures as above, but at least ten times as much rain in the wettest month of summer as in the driest month of winter or, alternatively, where 70% or more of average annual precipitation is received in the warmest six months. *Dwd* refers to Monsoon-influenced extremely cold subarctic climate, with the coldest month averaging below –38°C and 1–3 months averaging above 10°C, and with the same precipitation criteria as with *Dwc*. These classes have the greatest temperature range of all climates. See M.C. Peel, B.L.

As this document is an unclassified one, of necessity there will be gaps and omissions that the informed reader may not fail to recognize. Obviously these are unavoidable. Gaps and omissions exist also, because it is well nigh impossible to include every detail. However an honest attempt has been made and, were time unlimited, there would be no gaps.

It should be understood that this document does not attempt to dwell on the technical nor scientific side of Arctic and Sub-Arctic operations. It simply narrates the work and expeditions undertaken in these regions by members of the RCAF. Technical and scientific data can be found elsewhere, but reports of this nature are for the main classified.

Finlayson, and T. A. McMahon, "Updated world map of the Koppen-Geiger climate classification," *Hydrology and Earth Systems Science* 11 (2007): 1633–1644.

Chapter 1

RCAF BACKGROUND

First Steps

In February 1909, J.A.D. McCurdy and F.W. Baldwin, charter members of Dr. Alexander Graham Bell's Aerial Experiment Association, successfully flew their "Silver Dart" biplane over the ice-covered surface of Bras d'Or Lake at Baddeck, Cape Breton Island. These brief flights have been recognized by the Royal Aero Club as the first true heavier-than-air flights made by British subjects anywhere in the British Empire.

That summer McCurdy and Baldwin took their biplane to Petawawa Military camp to demonstrate before senior officers the role which aircraft might play in war. The two aviators suggested that the aeroplane could be used to reconnoitre enemy positions and range artillery fire. McCurdy and Baldwin accurately stated what the new invention might do, but the demonstrations at Petawawa were not successful in proving what the aeroplane could do. The "Silver Dart" after several flights of about half a mile was wrecked in a heavy landing; a second machine was also damaged, and the Militia Council, unimpressed, decided to await the outcome of experiments in Britain before proceeding further.

It is interesting to note that in the Great War of 1914-1918, during which time the seed for the RCAF was planted, McCurdy was manager of the Curtis Flying Company's school in Toronto from 1915 to 1916. Through this school passed the first recruits for the Royal Naval Air Service (RNAS) and the Royal Flying Corps (RFC), and among those were Air Marshal Robert Leckie, Chief of the Air Staff, and Air Marshal H. Edwards, Air Officer Commanding-in-Chief, RCAF, Overseas, now both retired.

In the years between 1909 and 1914 Germany, France, Britain and many other countries organized air forces. When Canada began mobilizing the First Contingent for World War I, Sir Sam Hughes offered to provide a corps of six military aviators, an offer which the War Office gladly accepted. In the event, however, six proved to be too ambitious a number, only two pilots were actually enrolled. With an American biplane which the government purchased for \$5,000, these two men constituting the Canadian Aviation corps, accompanied the First Contingent overseas in 1914. However, the Burgess-Dunne biplane,

Canada's first military aircraft, became a heap of "worthless junk" behind a hangar on Salisbury Plains. So ended the Dominion's first aviation corps.

During World War I Canada provided many thousands of recruits for the Royal Flying Corps, the Royal Naval Air Service, and their successor, the Royal Air Force (RAF) and brilliant was the part played by many of her sons, the foremost of whom were Bishop, Ball, Collishaw, Barker, McLaren and many more too numerous to mention. By 1918 there were over 6,600 Canadian officers in the RAF; approximately one pilot in four came from this Dominion, and in August of that year Air Ministry issued instructions to form two squadrons manned entirely with Canadian personnel, however the squadrons did not actually form till after the Armistice. Early in 1919 the formation of the Canadian Air Force (CAF) was carried a step further by the formation of No. 1 Canadian Wing "as a purely Canadian Unit" to administer the two squadrons. The intention then was to return the two units to Canada, intact, as the nucleus of the new Canadian Air Force. Future plans were, however, still quite nebulous and, until the Dominion government could decide its policy, training continued in England.

While the Air Council and Canadian military authorities in Britain were setting up a Canadian Air Force overseas, the Admiralty and Department of Naval Service had been organizing another air service in Canada. Authority was granted for the establishment of this service in 1918 and it was their responsibility to carry out convoy and coastal patrols to maintain the security of the Atlantic seaboard. Since it would be early 1919 before the Royal Canadian Naval Air Service (RCNAS) would be ready to begin operations, the United States Navy (USN) undertook to carry on in the interval. Aircraft and personnel were sent to the two stations at Halifax and North Sydney. Seaplane flights from the first station began in late August, and in the following month from Sydney. The USN commander at Halifax, Lieutenant Richard E. Byrd, was later to win great fame as an aviator and explorer.

When the Great War ended, Canada had two Air Forces under formation: one overseas, the other in Canada. Within a month of the Armistice an order-in-council was issued (5 December 1918), discontinuing the RCNAS "for the time being" and its personnel was released. Meanwhile the Canadian Air Force in Britain had continued its training, at RAF expense, in the expectation that the training would be completed by 30 June 1919 and the units would then be transferred to Canada. The Canadian authorities were unable, however, to formulate a definite air policy by that date and demobilization of the CAF began. Thus it was that the formation of a Canadian Air Force was suspended.

Formation of the Air Board

The termination of the 1914-1918 war released a large number of Canadian pilots, many of whom, on their return home, sought to continue flying as a civil occupation. Small flying enterprises made their appearance all over the country, creating a situation which called for immediate regulation to safeguard both the general public and the pilots themselves. The Government, through the Air Board Act, which was assented to on 6 June 1919, created an Air Board and charged it with the duty of guiding and developing aviation in Canada along sane channels.

The Air Board was composed of seven members. A chairman was appointed by the Governor in Council, who also appointed another member (the Judge Advocate General) to be Vice-Chairman. The departments of Militia and Defence and Naval Service were represented by their respective Ministers, and the remaining members were the Deputy Postmaster General, the Assistant Deputy Minister of the Naval Service and the Chief Inspector of the Department of Customs and Inland Revenue. The work of the Board was divided into three branches, under: (a) the Superintendent of Flying Operations, (b) the Superintendent of the Certificates Branch, and (c) the Secretary.

The Board took over the seaplane stations erected during the war by the Department of the Naval Service at Halifax and North Sydney (Nova Scotia), and that portion of Camp Borden (Ontario) which had been developed as an aerodrome by the Royal Air Force and acquired by the Department of Militia and Defence after the conclusion of the war. In addition to the aircraft and equipment thus acquired, 16 aircraft were received from the Air Ministry by way of replacement of those presented from time to time during the war to the Canadian forces through the activities of the Overseas Club. The Imperial Government also presented to Canada, aircraft and equipment, including 80 aeroplanes, 14 flying boats, 12 airships, 6 kite balloons, 300 motor and other vehicles, and a substantial amount of armament, wireless instruments, cameras and other technical and general stores.

One of the first tangible results of the Air Board's work was the publication of "Air Regulations, 1920," which had been approved by the Governor in Council on 19 December 1919 and became effective on 17 January 1920. These regulations embodied the various measures which had been submitted by the Board for the control of civil aviation in the Dominion, on the lines of the International Convention for Air Navigation.

Organization of the Canadian Air Force

The constitution of a Canadian Air Force was given early consideration by the Air Board and, on its recommendation, the organization of the Canadian Air Force was approved by Order-in-Council dated 18 February 1920.

The idea underlying the formation of the CAF was to invite former officers and airmen of the RAF to offer their services as members of the CAF on the understanding that they would, in peacetime, not ordinarily be called upon for active duty for more than one month in any two years; that they would only receive pay for the time so spent on active duty; and that the term of enlistment of airmen would be four years. The force was to be a militia non permanent force, [with] almost the whole of the personnel to be non-professional (the professional personnel to be only a nucleus at a training centre and to be negligible in number). The Order-in-Council creating the force pointed out that as strength in the air must ultimately depend on civil or commercial aviation, war formations (under the prevailing conditions) should exist on paper and not in the form of embodied units, and that training for war should be periodic, intensive, and widespread. It recognized, however, that for the proper organization of the staff and for instructional work, a longer period of duty was necessary, and the employment of officers and men for such duties for a period of not more than one year was therefore permitted.

Under authority of the same Order-in-Council, a “Canadian Air Force Association” was formed, with provincial branches and executive committees whose duties were, amongst other things, to maintain a roster of the officers and airmen belonging to them and to select individuals in turn for their tour of training.

Reorganization of the Air Board

As the original Air Board had completed the preliminary organization work for which it had been appointed, it was decided to reorganize the Board to enable it to efficiently perform its dual duty of regulating civil aviation and administering the CAF. Such reorganization was carried out under the provisions of the Order-in-Council dated 19th April, 1920.

The purposes of the new Board, which also consisted of seven members, were as follows:

- The regulation of civil aviation, such as the certification of airworthiness, the licensing of pilots and the encouragement of civil and commercial aviation generally;

- The conduct of civil government air operations, such as forestry protection, photographic surveys and fishery patrols;
- The air defence of Canada, including the organization and administration of the Canadian Air Force.

Accordingly, three main divisions were set up, under the executive control of (1) the Controller of Civil Aviation, (2) the Director of Flying Operations, and (3) the Inspector-General of the Canadian Air Force.

CAF Training, 1920-1922

Camp Borden was transferred from the Department of Militia and Defence to the Air Board for use as a training centre early in July 1920. Regulations of the CAF were approved on 31 August and No. 1 Wing was formed at Camp Borden on 7 September. No. 1 Wing comprised a school of special flying (Avro training aircraft); a flight of fighter scouts (S.E. 5s and some Camels); a flight of bombers (D.H. 9a s); a ground instructional school; and equipment, victualling, medical and camp maintenance branches. The camp was opened for training on 1 October 1920.

Until 31 March 1922, training was carried out at Camp Borden under the 28-day “refresher” scheme, using the war equipment donated to Canada by the Imperial Government. While the actual strength at no one time even closely approximated the authorized establishment of 1,340 officers and 3,905 airmen, a considerable number of officers and airmen were trained. It was discovered, however, that the period of training was of too short duration to keep the pilots or machines properly trained in Air Force duties, and that the expenditure for this training was not warranted. On 1 April 1922, therefore, the granting of refresher courses to officers and airmen who had served during the war ceased, the administrative and instructional staff was reduced, and a number of surplus officers were appointed for duty on flying operations for other government departments at various stations throughout the country.

Formation of Department of National Defence

In 1922 the Government decided to centralize the control of the defence forces of the Dominion and an Act of Parliament was passed constituting the “Department of National Defence” by the amalgamation of the Department of Militia and Defence, the Department of the Naval Service, and the Air Board under one minister. The Act came into effect by Order-in-Council on 1 January 1923, and simultaneously the Militia Council and Air Board were dissolved.

On 29 June 1922, an Order-in-Council had been passed approving a temporary organization for the C.A.F. to cover the transition period. Under this, the personnel of the operational branch of the Air Board, who were then civil servants engaged in flying operations for other government departments, were absorbed into the Air Force; the whole organization being placed under a Director of the Canadian Air Force, who was made responsible to the Chief of Staff (Militia Service) for the control of aeronautics in all its phases, civil as well as military. This was the basis of organization when the National Defence Act came into force in January 1923. A month later, His Majesty the King, approved the designation "The Royal Canadian Air Force."

Formation of R.C.A.F on Permanent Basis

On 1 April 1924, "The Kings Regulations and Orders for the Royal Canadian Air Force," providing for an Active (Permanent and Non-Permanent) Force and a Reserve, became effective.

The Permanent Active Air Force was to consist of officers and airmen permanently embodied or employed for continuous service and available for general service. It was to be maintained for the instruction of the Non-Permanent Active Air Force—the latter to comprise such units or detachments and other formations as were from time to time named by the Governor-in-Council.

The Air Force thus emerged as the third defence service of the Dominion on a permanent basis, but although organized as a separate service it remained a directorate of the Chief of Staff's. Branch in the Department of National Defence, administered through the Director of the Royal Canadian Air Force. Strength at this time was 61 officers and 262 airmen.

The force did not immediately engage exclusively in military activities. Bases were taken over from the Air Board at Vancouver, B.C., High River, Alta., Winnipeg, Man., Ottawa, Ont., and Dartmouth, N.S., together with numerous sub-bases, [which] carried on with flying operations as in the past, except that they were now administered as RCAF stations and the personnel manning them were under Air Force discipline.

The building up of an Air Force as a defence arm was begun under the handicaps of an insistent demand for operational personnel for civil government operations (aerial surveying, forest protection, fishery patrols, transportation, etc.) and restricted appropriations, which did not permit the maintenance of service and civil government operational units at the same time. In this connection, the following extract from the Report of the Department of National Defence for the year ended 31 March 1926 is of interest:

“This force is still very much handicapped by lack of suitable equipment owing to the, paucity of funds. Old material has had to be used as well as unsuitable equipment. A great deal of the equipment still in use is part of that presented by the British Government to Canada in 1919. The only two modern scout airplanes at present in Canada are on loan from the British Government. These are being used for forestry protection in Alberta.

Special attention is directed to the very hazardous flying which is carried out in many parts of Canada, particularly in Alberta and Manitoba, by the pilots of the Royal Canadian Air Force. It is imperative that no false ideas of economy should be allowed to interfere with the provision of the very best material available in the world for the use of the personnel of the Royal Canadian Air Force in these operations, undertaken to protect the forests of Canada and for the execution of aerial survey.”

The training of individual personnel in service duties, therefore, received first consideration and by degrees primary flying instruction was augmented by courses in military flying and allied subjects, to which officers were posted as they could be spared. The central training establishment was maintained at Camp Borden, where R.A.F. methods and standards (suitably modified where necessary to conform to Canadian conditions) were adopted. Standardization was achieved by sending selected officers to England periodically to attend courses of instruction in service subjects and employing them as instructors on their return to Canada. Courses in flying and other air force duties were held each summer for the instruction of a new generation of pilots to replace the older war-trained personnel as necessary. These young officers were drawn from the Officers, Training Corps of the Canadian universities, and gentlemen cadets in the Royal Military College. During their summer vacations they were given instruction over a period of three years.

An RCAF Liaison Office, housed in the Air Ministry and in charge of an officer of the Permanent RCAF, was maintained in London for the collection and transmission of intelligence between the R.A.F. and the RCAF.

1927 Reorganization

From 1924 to 1927, considerable headway was made in the use of photographic aircraft for air survey purposes, and there was such a large expansion in this and other work performed for other government departments that it was deemed advisable to reorganize the section of the staff dealing with

civil government air operations. Accordingly, on 1 July 1927, the following four separate branches of the air services were formed within the Department of National Defence:

- The Directorate of Civil Government Air Operations, to administer and control all air operations carried out by government aircraft other than operations of a military nature;
- The Controller of Civil Aviation, responsible for the Administration of Air Regulations; inspection and registration of aircraft; inspection and licensing of air harbour, and examination and licensing of pilots and air engineers;
- The Aeronautical Engineering Division, responsible for all technical and engineering matters for the air services, and available for consultation by all organizations operating aircraft in the Dominion;
- The Royal Canadian Air Force. The first three of these branches were responsible directly to the Deputy Minister of National Defence, while the RCAF continued to be administered by the Chief of the General Staff (whose title was changed from "Chief of Staff" on 1 June 1927) through the Director, RCAF.

The policy of the RCAF was as follows:

- To develop and maintain air power in Canada;
- To provide adequate training facilities for Canadian aviation;
- To provide a nucleus Air Force round which Service units could be formed in the event of war;
- To provide aircraft for government flying operations, such as forest fire protection and aerial mapping;
- To build up a reserve of pilots and mechanics.

After this reorganization, however, civil government work again increased so that eventually it completely overshadowed the training and organization of the force for war. Civil aviation also showed considerable expansion and in 1928 the flying club movement came into being, adding to the demand for pilots (the supply of which had already become a major problem). Out of a total of 131 officers and 590 airmen on the strength of the Force as at 31 March 1929, approximately half was attached for duty with the other branches of the air services.

The task of supplying alike trained personnel for civil and government air enterprises fell to the RCAF training centre at Camp Borden, augmented by

seaplane training facilities at Vancouver. As flying instructors were the first necessity, but unobtainable readily in Canada, pilots who had completed their short-term commission engagements in the R.A.F., and who possessed the necessary qualifications, were offered temporary employment in the RCAF until the situation eased.

Civil Government Air Operations

Much of the work done by the Air Force for other civil government departments embraced the northern section of Canada and came to the knowledge of the public sparingly. By 1932, the Air Force counted as past history the Hudson Straits Expedition, which on its return in 1928 contributed greatly to the knowledge of the meteorological and navigational conditions prevailing in those perilous waters lying along the new grain route from the Prairie Provinces to Europe. It had also photographed approximately 470,000 square miles of the Dominion for mapping purposes, using cameras, equipment, and methods specially developed in Canada for the purpose. An area of 140,000 square miles of forest lands was being patrolled annually for the detection and suppression of fires. Air mail routes had been surveyed and experimental flights made. Air Force aircraft were contributing to the efficiency of all government departments by transporting parties and officials into locations which heretofore had been inaccessible except by canoe and dog sled. The pilots of the force had covered the country from coast to coast and from the United States boundary to the southern shores of the Arctic Ocean, and had gained a vast amount of useful experience in operating aircraft under the difficult conditions found throughout Canada's uninhabited areas.

1932 Curtailment

In 1932 the world economic depression overtook the Dominion. Its effect on the Air Force is best shown by a comparison of the funds voted for its annual tasks. In 1924-25, \$1,561,000 was appropriated for its use, rising to \$7,475,700 (of which \$4,965,700 was for civil air operations) in 1930-31. For 1931-32 the total vote was reduced to \$5,332,000, and for the following year (1932-33) it was cut to \$1,750,000, including only \$190,000 for civil aviation. This drastic reduction necessitated the discharge of 78 officers and 100 airmen who, together with 110 civilians laid off, comprised almost a third of the force.

Relinquishment of Civil Operations

The first clearly defined period in the history of the RCAF had been mainly one of assistance in developing the country's natural resources, but the military

side had not been entirely neglected. The majority of the permanently employed personnel of the force were individually qualified in a variety of subjects necessary to the efficiency of an air defence force. A nucleus flight of a fighter squadron and an army co-operation squadron had been trained. Combined exercises with the Navy and Army had been an annual feature of the training of personnel for the army co-operation flight.

With the 1932-33 reduction in the financial appropriation, the policy of the RCAF was changed and the service side for the first time took precedence over civil operations. The air estimates for 1933-34 were \$1,697,000, a slight reduction from the previous year's vote, but thereafter they gradually increased, reaching in 1938-39 a figure of \$11,686,517 of which all but \$356,000 was for service training and operations.

Prior to the Depression, commercial firms and certain of the provincial governments had entered the field of air service operation. This factor, and the reduction of the Air Force, made it unlikely that the force would, in future, be called upon to continue operations for civil government departments. As conditions improved, this turned out to be the case and the provincial governments and commercial operators took over the majority of the work previously performed by the RCAF with the exception of air survey photography, which was still undertaken on a very limited scale for the Dominion Government.

Effective 1 November 1932, the RCAF and the Directorate of Civil Government Air Operations [were] consolidated and, together with the Aeronautical Division (which still retained its responsibilities with respect to civil aviation), were placed under the Director, RCAF, who thereupon assumed the new title of "Senior Air Officer." In 1936, the Civil Aviation Branch of the Department of National Defence was transferred to the Department of Transport.

Non-Permanent Active Air Force

As previously mentioned, the constitution of the RCAF laid down in 1924 provided for an Active and Reserve Air Force, [with] the Active Air Force being divided into "Permanent" and "Non-Permanent." The formation of all but the Permanent Active Air Force (PAAF) had been postponed from year to year due to the urgency of other demands, but in 1932 tentative regulations for the Non-Permanent Active Air Force (NPAFF) and the Reserve of officers were completed.

The first three units of the NPAAF, Nos. 10, 11 and 12 (Army Co-Operation) Squadrons, were formed at Toronto, Vancouver, and Winnipeg, respectively, in 1933. Nos. 15 (Fighter) and 18 (Bomber) Squadrons, located in

Montreal, were added in 1934, followed in 1935 by Nos. 19 and 20 (Bomber) Squadrons at Hamilton and Regina. As these units became sufficiently advanced, they attended annual camps for 14 days' service training. In 1937, the designation of NPAAF units was changed by adding "100" to the previous numbering of the squadrons; thus, No. 10 (A.C.) squadron became No. 110. On 1 December 1938, the name of the NPAAF was changed to "Auxiliary Active Air Force."

Opening of Trenton Air Station

In September, 1931, two flights (Fighter and Army Co-Operation) of the Permanent Active Air Force were transferred from Camp Borden to Trenton, Ontario, the new training station which was then in course of construction to replace Camp Borden.

1935-1939 Development

In 1935, the personnel and aircraft then based at Ottawa, which had been co-operating with the Royal Canadian Mounted Police (RCMP) off the eastern sea-board every summer, were moved to Dartmouth air station—a wartime base operated by the Navy and which had been taken over by the Air Board, but had been closed for many years. A new unit so formed - No. 5 Flying Boat (FB) Squadron - continued to operate with the RCMP for another year. No. 4 (F.B.) Squadron, formed in 1932, was stationed at Vancouver.

With the increasing political tension in Europe in 1935, a more rapid pace of development was forced. Plans were consequently laid which resulted in the expansion of the army co-operation flight to a squadron (No. 2) and the formation of No. 6 (Torpedo Bomber) Squadron and No. 3 (Bomber) Squadron. This latter unit at first administered the fighter flight which became No. 1 (Fighter) Squadron in 1937.

The increased rate of expansion immediately created a demand for personnel qualified as instructors. To make them available it became necessary to reduce to a minimum all operations which did not contribute directly to the building up of a defence force. RCMP patrols were discontinued at the end of 1936, and No. 5 Squadron was reorganized as a coastal reconnaissance unit and renamed accordingly. All operations for other government departments, with the exception (in part) of survey photography, were also discontinued. The detachments doing these extraneous tasks were consolidated into No. 8 (General Purpose) Squadron, Ottawa, and operational bases in the Prairie Provinces were closed down.

Construction of the new training centre at Trenton, which had been carried on as a relief project during the Depression, was speeded up in 1936, and early in that year the technical training and army co-operation schools moved there from Camp Borden. The flying training and air armament schools moved in June 1937. Three new specialist schools were formed to give instruction in navigation and seaplane flying, wireless and storekeeping, making the Trenton station a complete and modern training centre. At the same time, stations and bases on both coasts were further developed and improved.

Several changes in the organization of the force took place during 1938, the most important being:

- 1 March - Organization of Western Air Command (Vancouver);
- 15 September - Organization of Eastern Air Command (Halifax);
- 15 September - Organization of Air Training Command (Toronto);
- 19 November - Vesting in the Senior Air Officer (whose title was changed on 15 December to "Chief of the Air Staff") of the responsibility for control and administration of the RCAF, directly under the Minister of National Defence.

The effect of these changes was to place the Air Force on the same footing as the Navy and the Army, and all powers previously exercised by District Officers Commanding, Military Districts in relation to the RCAF were transferred to the respective Air Commands. Effective 19 November 1938, Air Force orders ceased to be promulgated by the Adjutant-General of the Canadian Militia.

With the gradually increasing amount of money voted to the air services since the reduction in 1932, the strength of the force increased [progressively] from 103 officers and 591 airmen (all P.A.A.F.) as at 31 March 1933, to 261 officers and 1,930 airmen of the Permanent Active Air Force and 99 officers and 867 airmen of the Auxiliary Active Air Force as at 31 March 1939,

As the international situation deteriorated during the summer of 1939, all efforts were directed towards completing the organization of the force as necessary for the defence of Canada, particularly on the east coast.

Mobilization for War

On 2 September 1939, the whole of the Permanent Active Air Force and the seven squadrons of the Auxiliary Active Air Force were placed on active service. Eight days later, when Canada entered the war, mobilization was ordered. It was ruled that, for the duration of the war, no distinction should be made between Permanent and "Auxiliary" units, and the formation of a new component (The

Special Reserve), for war-time appointments and enlistments, was authorized and placed on active service.

Despatch of Units Overseas

On the declaration of war, training was immediately intensified in order to provide for an overseas force, should such be required, and to train reinforcements for the operational units. However, in view of the heavy duties assigned to the RCAF in the manning and administration of the British Commonwealth Air Training Plan (the agreement for which was signed on 17 December 1939) it was then considered advisable both by the United Kingdom and Canadian authorities to limit the overseas contingent of the RCAF to one army co-operation squadron, together with the necessary administrative staff and reserves for replacement of wastage, to work with the 1st Canadian Division. In December 1939, therefore, No. 110 (City of Toronto) Army Co-operation Squadron, having been augmented by personnel from No. 112 (City of Winnipeg) Squadron and a permanent force unit, was selected for service overseas and arrived in England during February 1940. [With] the unexpected turn of events in Europe early in 1940, having caused a reversal of earlier plans, this squadron was followed in June of that year by No. 1 (Fighter) Squadron, which incorporated personnel of a permanent force unit and of No. 115 (Fighter) Squadron, Montreal, and by No. 112 Squadron, which has since been converted to a fighter squadron.

Appointment of Air Minister and Organization of Air Council

In May 1940, a Minister of National Defence for Air was appointed to administer the air service, and in June of the same year an Air Council was created to advise the Minister on matters relating exclusively to the air service.

Summary

From its tiny force of 4,000 men at the outbreak of war, the RCAF expanded to over 206,000 by the end of 1943 and held fourth place among the Air Forces of the United Nations. It developed and administered the great British Commonwealth Air Training Plan which produced 131,553 trained airmen for the British and Dominion Air Forces. At home the RCAF put over forty squadrons into the field which, in addition to guarding our coasts and sharing in the Aleutian operations, played a very important part in co-operation with Coastal Command and the British Canadian and American Navies in the hard fought battle of the Atlantic. Overseas the RCAF contributed forty-eight squadrons for service with the several Commands of the RAF. Fourteen of these

units formed a special RCAF Group (No. 6) in Bomber Command; fourteen others constituted four wings in the Second Tactical Air Force. Other squadrons flew with Coastal Command over the North Sea, the Bay of Biscay and the Atlantic, fought with the Desert Air Force from Alamein to Treviso, patrolled over the Indian Ocean, and carried supplies to our armies in North-Western Europe and Burma. In addition to the personnel of these units at home and abroad, great numbers of Canadians served in RAF formations in every theatre of war. The RCAF suffered 18,463 casualties in killed, presumed dead and missing; it won over 8,948 awards for gallantry.

Now the RCAF is contracting to post-war requirements. These plans call for a force of three components: Regular, Auxiliary, and Reserve. The Air Cadets will also be continued as a valuable training ground for our youth. Though relatively small, it is believed that this force will be a well balanced arm which, should occasion ever again arise, can be expanded into a great war-time training and operational Air Force just as the RCAF was expanded after 1939.

Chapter 2

EARLY SUB-ARCTIC OPERATIONS

Introduction

From an editorial in *Canadian Aviation* [in] March 1934, I quote: “[does] all Canada remember that the Royal Canadian Air Force first removed the veil of secrecy from our treasure-laden Northland to mark the opening of an epochmaking period of development? Or that immeasurable wealth was conserved by aerial forest protection and that invaluable photographic and survey work was accomplished with greater dispatch than was hitherto dreamed possible?”

Editorials are often a collection of high sounding phrases making one distrustful of their true wealth or meaning; however let us look at the facts.

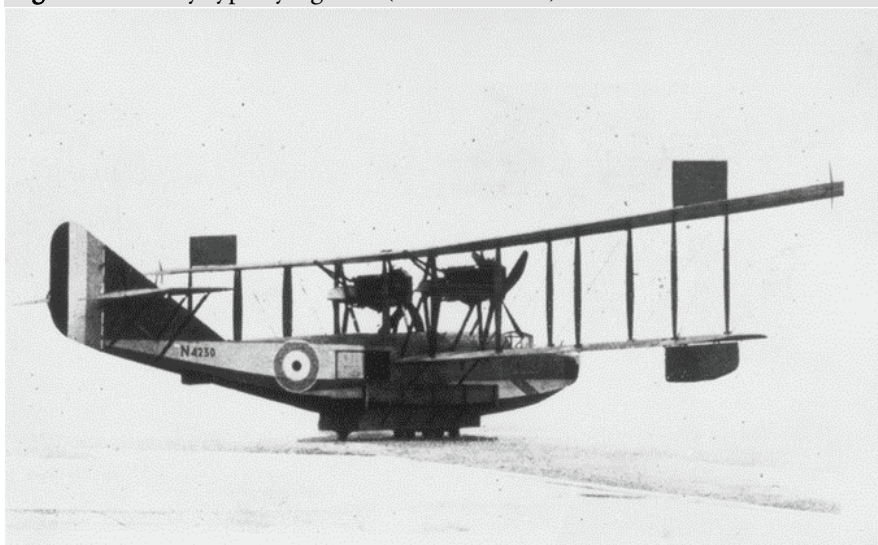
The Civil Government Air Operations (C.G.A.O.) Directorate, since its establishment in 1920, supervised and conducted federal interdepartmental air activities, co-operation being maintained between no less than nine different departments in the employment of aircraft, and a great diversification of duties was to be found in the routine throughout the twelve months. According to the official data there were 15 types of work as follows: forest fire patrols, photography, reconnaissance, [preventative] service, fisheries patrols, treaty payments, rust control dusting, operations around Churchill, Hudson Strait expeditions, air mail investigations, transportation of government personnel, aeroplane testing and experimental work and miscellaneous.

Getting down to figures, the C.G.A.O. Directorate was responsible for 54,638 hours of actual flying from 1920 to 1931 inclusive, on behalf of the various departments at Ottawa. The annual totals regularly from year to year, with one or two early exceptions, while the “hourage” was truly tremendous from 1927 to 1931, thus indicating the heavy increase in civil government flying in that time.

By far the greatest portion of the work of the C.G.A.O. Directorate was done for the Department of the Interior over the eleven years with a grand total of 24,408 hours for forest patrols; 15,783 hours for aerial photography for the Topographical surveys; and 1,068 hours for the Geodetic Survey.

The forest areas patrolled for fire detection have been stupendous. For several of the early years, the patrolled territory, including only the actual forest lands, covered around 34 million acres, but in 1929 and 1930 the forest territory regularly covered was no less than 92 million acres.

Figure 2-1: Early type flying boat (Felixstowe F.3)



Reports from the stations themselves give a more precise account of the varied operations carried out. An extract from the Victoria Beach station follows:

Victoria Beach

This air station, on the southern shore of Lake Winnipeg, was established at the request of the department of the Interior for protecting forest reserves in Manitoba.

The tract of country lying between Lake Winnipeg and the western boundary, where the danger of fire was greatest, was reconnoitred daily; and weekly, from August to October, a patrol was sent to Norway House, thence along the northern and northwestern shores of Lake Winnipeg. It flew to Cedar Lake, thence south, along Lake Winnipegosis, to the town of that name (where the machine was refueled); thence south to Lake Winnipeg; and [then] southwest to Victoria Beach. Also from Norway House, long distance patrols were sent to Le Pas, [Cumberland] House, and the Carrot River triangle in Saskatchewan.

The machines used were flying boats—two F3s, fitted with twin Rolls-Royce engines, for long distance flights; and for work closer to the base, an H.S.2L. with a Liberty engine.

Minor operations included photographic work on the Winnipeg River for the Water Powers Branch; also the conveyance of survey parties, with supplies for their maintenance, in the district east of Lake Winnipeg.

Air coverage was very popular and had the full support of the District Forestry Officer as he stated that, provided with air patrols, he could dispense with the services of a large number of employees who are obliged to make use of canoes as their only means of transportation.

During the winter months the personnel and machines were withdrawn to the city of Winnipeg, where facilities for the overhaul and conditioning of machines had been arranged. As early as weather conditions permitted, the operating stations were opened. The machines were sent by rail to Victoria Beach, erected there and flown to the other bases. The dates of opening in 1923 were: Victoria Beach, 25 May; Norway House, 11 June; [and] Le Pas, 13 June.

The Pas

The Pas base is situated at the junction of [the] Pas and Saskatchewan [rivers], approximately 275 miles northwest of Winnipeg and 150 miles due west of Norway House. [When the station was opened] on 13 June 1923, both these rivers were in flood and the difficulty of mooring the machines in the heavy current and unsheltered position was great. Various lakes in the district might have been used but for the difficulty of communication and refuelling in the flooded state of the country.

An important operation for the Topographical Survey Branch had been planned to be undertaken from this base. Owing to delays in the delivery of the new machines it was not possible to undertake this in the early part of the season when the weather conditions are particularly suitable for photography. An attempt was made during the first week of September, when a flight was made to the north end of Reed lake with Mr. Davidson, D.L.S., of the Topographical Survey, as observer. After a few exposures were made, engine trouble ensued and after repairs were effected the weather was unfavourable for flying until 12 September. On that date continuous photographs were taken over Reed and Cranberry Lakes to Lake Kissinew. Mr. Davidson operated the camera and navigated the machine. On arrival at Pukattawagon the machine was immediately refuelled and another flight made, photographs being taken along the 18th base line from the Saskatchewan-Manitoba boundary to Setting Lake. A landing was made at Little Goose Lake. On the following morning another flight was made over Reed and Cranberry Lakes to Kissinew, where rainstorms were encountered and further photography was impossible. The machine then returned to Pukattawagon. On 14 September the weather was again fine and photographs were taken over Sisipul Lake and thence following

the chain of lakes back to the Pas. The machine was then refuelled and photographs were taken over a course east along the Churchill River to Nelson Lake, southwest along Cold River, over Cold Lake and Athapapuskow Lake, east along the 18th base line along the West end of Limestone Lake, and thence to The Pas. This completed the photographic operations required. Twenty-five hours flying was necessary for this work.

Norway House

Norway House is situated on the eastern channel of the Nelson river, about 40 miles from Lake Winnipeg and about 300 miles due north of Winnipeg city. Machines were operated from Forestry Island, the district forestry headquarters. The only means for transportation (other than by air) to Norway House was by means of steamboat from Selkirk to Warrens Landing and thence by launch or canoe. The sub-base was opened on 11 June 1923, and communication by wireless, operated by the Royal Canadian Corps of Signals, with air headquarters at Winnipeg, was maintained from 25 June to the end of the season. The first forestry patrol was carried out on 14 June and from that date patrols were maintained almost continuously, though on a few occasions machines were not available to carry out the daily patrol required. In all twenty forest fires were located from the air and handled under direction of the district ranger at Norway House. During the latter part of the season the Forestry Branch detailed a forest engineer to accompany the machine on patrol and much valuable work was done in forest type sketching. The area thus mapped amounted to some 2,500 square miles. The total amount of flying on forestry work from Norway House was 75 hours and 45 minutes for the season. A cache of 400 pounds of provisions was transported to Cross Lake for a Geological Survey party. Further work for the same branch had been planned but owing to shortage of machines it was not possible to carry out the full programme.

The most important aerial survey operation of 1924 was the oblique photography of the water courses from The Pas to [Pukatawagan], thence west along the Churchill River to Reindeer River, thence north to Reindeer Lake, over its entire area, thence in a westerly direction along the Churchill River to Stanley Mission and from Stanley Mission to Isle-a-la-Crosse, and thence south by the Beaver River to the Saskatchewan River at Prince Albert.

This required very careful planning in advance. As the territory to be covered is quite beyond the ordinary means of transportation, refueling bases had to be established along the route. The laying of these was arranged for by the Topographical Survey, with the assistance of the Hudson's Bay Company and Revillon Frères, who willingly co-operated in the work and, throughout the entire expedition, lent most valuable advice and assistance besides providing, at

***Equipment with Weights Carried Photographic Operations,
Reindeer Lake and Churchill River – S/L Hobbs Report***

	Lbs.	Lbs.
Emergency rations	56	
Emergency equipment, such as cooking utensils, tents	39	
Engine spares, machine spares, tools, etc	80	
Collapsible canoe, shotgun, ammunition, lantern, etc	37	
Ropes, hose, refuelling funnels, etc	15	
		227
Photographic equipment -		
Camera, aero	50	
25 film rolls	111	
Magazine and control board	35	
Graflex hand camera	10	
		206
Pilot	180	
Engineer	180	
Photographer	180	
Navigators (D.L.S.)	180	
		720
112 gallons gasoline 7 ½ lb per gallon	840	
8 gallons oil	70	
		910
Total load carried in machine		2,063
Weight of machine without load		3,000
Total weight of machine with load		5,863
Less wheels and tailskid		200

Note - Since the total allowable weight was 5,800 lbs, it was necessary to lighten the machine by removing the wheels and tailskid.

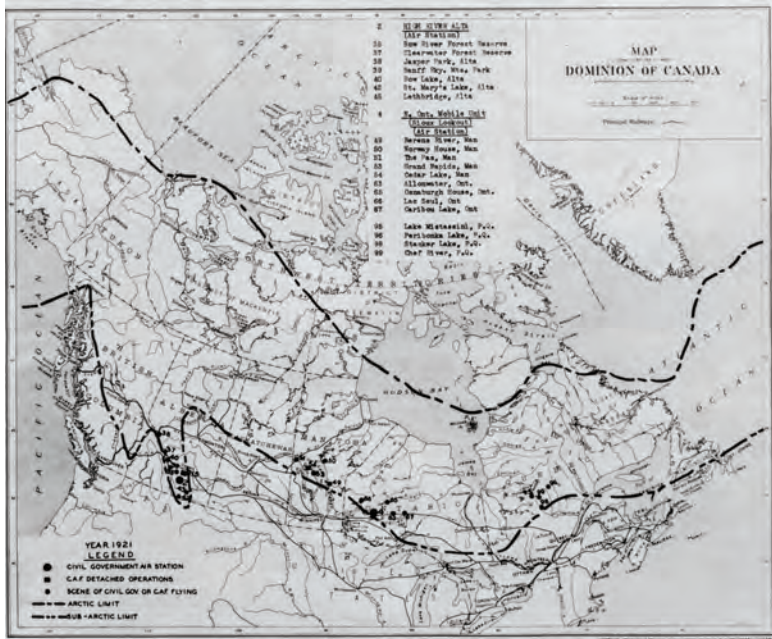
the different stopping places, hospitality for the members of the expedition. A glance at the map will show the extent of the country covered in this flight. It was certainly the greatest ever undertaken for aerial survey; and, when considered in the light of practical results, was one of the most brilliant achievements in the history of flying at that time. The most northerly point reached, Du Brochet at the head of Reindeer Lake, is 1,000 miles from the base at Victoria Beach and several hundred miles beyond any railway or steamboat communication.

Indian Affairs

Another duty of the Air Force at that time was the carrying out of operations for the Department of Indian Affairs.

In 1924 a party consisting of the Indian Agent, a doctor, the pilot, and the mechanic, proceeded to Crosse Lake from Norway House on 29 July. While the Indian Agent was paying treaty money, the pilot and mechanic assisted the doctor in vaccinating the Indians. On the following day, the work having been completed, the party returned to Norway House. Caches of gasoline had been placed at Oxford House, God's Lake and Island Lake, so that a round trip to these points could be made without returning to the base. On 31 July the flight was made to Oxford House and treaty money paid there. When attempting to leave for God's Lake, engine trouble developed shortly after rising from the water and the flying boat was forced to land. As the damage to the engine was so serious that they could not proceed, the remaining part of the journey was carried out by canoe, rather than wait for a second aircraft to be fetched from Norway House. The non-completion of this expedition was most unfortunate as the weather was ideal for flying during the week.

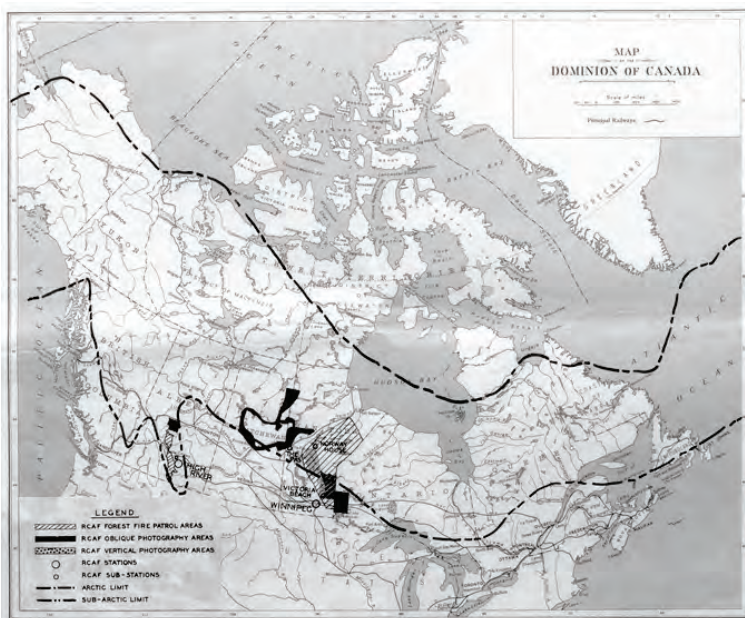
At 11 a.m. on 20 October, a telegram was received at Victoria Beach from Air Headquarters, stating that diphtheria had broken out in the Norway House district and asking if a flight could be made to Norway House, or, if impossible to land there owing to ice, to Warrens Landing, to carry medical aid which was urgently required. All aircraft had been withdrawn from the northern base ten days previously owing to the approach of the freeze-up. Twenty minutes after receiving the telegram an aircraft was on its way to Selkirk to procure the antitoxin, and another was standing by ready to transport it to Norway House. Delivery was made there, after a flight of 320 miles, within six hours of the receipt of the headquarters' wire. The machine returned to the base the following day. In all, eight hours and fifty-five minutes flying time was required to carry out this operation.



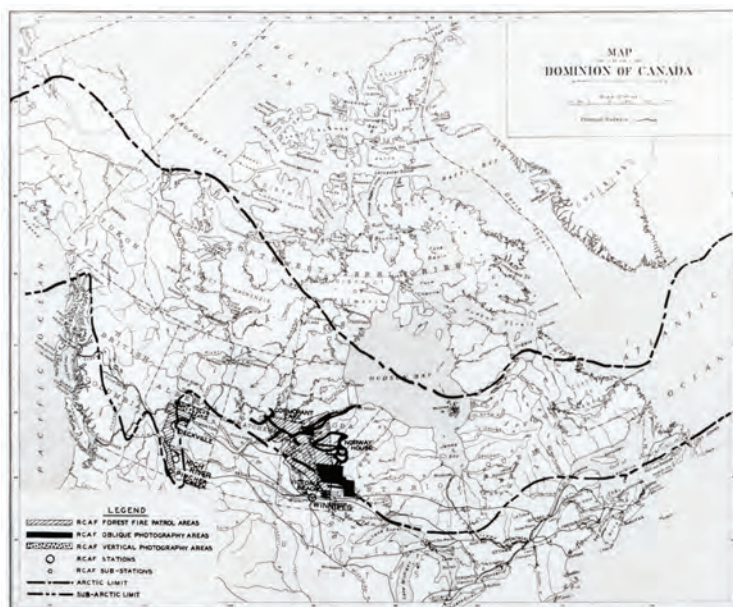
Map 2-1: Canadian Air Force Operations, 1921. Source: DHH 73/1324.



Map 2-2: Civil Operations of the Royal Canadian Air Force 1923. Source: DHH 73/1324.



Map 2-3: Civil Operations of the Royal Canadian Air Force 1924.
Source: DHH 73/1324.



Map 2-4: Civil Operations of the Royal Canadian Air Force 1925.
Source: DHH 73/1324.



Map 2-5: Civil Operations of the Royal Canadian Air Force 1926. Source: DHH 73/1324.

Churchill River Survey 1924

One of the more ambitious operations of 1924 was that carried out by Squadron Leader D.B. Hobbs on Aerial Survey in the Churchill River District.

The operation order drawn up by Air Force Headquarters in conjunction with the Topographical Survey Branch, called for photographs to be taken over an area “from Le Pas to Pukkatawagon, thence west, along the Churchill river to Reindeer river, thence northerly along the Reindeer river to Reindeer Lake.” The whole of Reindeer Lake, was to be photographed and a return flight was then to be made to “the Churchill river, and thence westerly to the Stanley Mission, and from the Stanley Mission to Ile-a-la-Crosse.” A direct course was then to be taken to Prince Albert, and the Saskatchewan River followed to Le Pas.

The journey in all was to cover some 2,500 miles and a rough estimate of 1,500 photographs were to be taken, which would give a plottable area of 15,000 square miles. If possible, a Dominion land surveyor from the

Topographical Survey was to be carried as a navigator and to direct the taking of photographs.

The longest flights were approximately two hundred and twenty-five miles; but, since photography commenced at the point of refuelling and the altitude called for was 5,000 feet, it was necessary to carry at least an extra hour's fuel [because] the machine available, when loaded with this weight, would not reach such an altitude in much less than an hour. It will, therefore, be seen that to ensure the success of the operation, considerable forethought and preparation were required, as the machine, after [departing] from its last point of communication at The Pas, would have to be entirely self-supporting until it reached civilization again at Prince Albert.

On 18 July, the machine with party, all equipment, and a full load of gasoline and oil, left Victoria Beach at 4:20 in the afternoon and arrived at Le Pas at 8:10 the same evening, after a flight of 325 miles. The operation order did not call for photographic work on this flight in any case the weather was entirely unsuitable and the hour late. It afforded, however, a good test of all equipment and enabled a good understanding to be arrived at between the members of the crew on the work they were about to commence.

On coming to Reindeer Lake the village of Southend was photographed, and on landing at Rabbit River photographs were taken of that place. A few circles made before landing showed that, while Reindeer Lake was a very large body of water, its formation as shown on the present maps was entirely misleading. The first impression of all the members of the crew was that it would be very difficult on the next flight to decide on the actual shore line. The whole district is a mass of intricate waterways spreading in all directions. The lake itself is dotted with islands, while the deep bays running far inland from its shores and the numerous adjacent lakes ... further increase the difficulty of defining its limits. The elapsed time for this flight was [3 hours and 25 minutes], and the distance covered was 200 miles.

From 23 July until the morning of 1 August, the machine operated on Reindeer Lake. Most of the work was carried out from Rabbit River, where fuel was available, but as the operation called for a network of photographs of the whole lake district, a flight was made on 7 July to the settlement of Du Brochet at the extreme north end of the lake. One night was spent there. On the morning of 28 July, the weather was exceptionally clear and departure was hastened in order to take advantage of every minute to obtain clear photographs. At an altitude of 5,000 feet over this village visibility appeared to be well over a hundred miles. All the waterways of the district to the north were clearly visible, including a clear view of [Wollaston] Lake. The flight and the taking of photographs on this particular day were most successful, but (as usual)

by the time the crew were prepared to land at Rabbit River, on the return journey, clouds were beginning to gather and the work had to be discontinued.

The continued interference by weather while in the Reindeer Lake district afforded an opportunity to study the country and its inhabitants, and several trips were made by canoe through the numerous rivers and lakes in the district. Food, of which there was no shortage, consisted [mostly of] bacon and canned goods, with bannock to replace bread. There was little meat available but plenty of fish. Moose meat was extremely scarce. The residents attributed this to the absence of flies in the North Country this year, consequently the moose were not driven to the water as in other seasons. Since the Indian does not leave his canoe, but always hunts by paddling in the waterways, little meat was obtained. The large herds, numbering thousands, of caribou and reindeer which move about in the district during the winter, had all moved north to their summer grating grounds in the "barren lands" by the time of our arrival.

With the exception of a few white people in charge of [Hudson's] Bay and Revillon Frères posts, and a few independent white trappers and traders, the inhabitants of the country are all Indians [First Nations].

The effect of the seaplane on the Indians was very similar to that noticed in other parts of the country where operations had previously been carried out for the first time. They would run into their huts or wigwams when the machine was landing and come out, dressed in the most brilliant colours and gaily decorated, when it was taking off. They would stare at the anchored machine for hours at a time; and when it moved slightly in the wind, they would all get up from where they were sitting and move back, gradually creeping forward until it moved again.

During the stay at Reindeer Lake the weather was extremely cold at night, and on several occasions it was necessary to drain the radiator in case of freezing. With regard to flying conditions, the engine would invariably be at boiling point when leaving the water, and by the time 5,000 feet was reached it was necessary to close the radiator shutters entirely. The crew of the machine suffered considerably from the intense cold and trouble was anticipated in the operation of the camera because of the low temperature, but there was no definite indication of this.

According to local inhabitants, the ice does not actually leave the lake until the end of June, and while it was difficult to obtain reliable information as to the date of the freeze-up, which was liable to take place at any time, it was obvious that cold weather was very close at hand. The summer season in this part of the country therefore is very short.

On August 11 conditions were again favourable and the machine got away easily. The Churchill was followed to Ile-a-la-Crosse, and the flights continued

slightly past the lake to a point on the Beaver River. This portion of the flight was not included in the programme, but as conditions were good it was decided to cover it with photographs. The weather then became overcast and a return was made to Ile-a-la-Crosse. This flight was again most successful.

Recorded below are the conclusions drawn by Squadron Leader Hobbs in the words of his own report:

“Throughout this report every effort has been made to bring out the conditions actually met without emphasis on the difficulties or favourable circumstances. Nevertheless the operation was complicated by factors not stressed in this reports such as flying in directions to put the sun behind us as much as possible, as well as getting weather clear of clouds and the chance of camera trouble where such intricate apparatus is used. There was also the fact that we were over quite unknown country where landings had to be made on unfamiliar water, with the added difficulty of getting altitude quickly in spite of a heavy load, in order that we could start photographing as soon as possible. That these, and many other adverse conditions, were safely overcome on the first really long expedition for exploratory survey, gives assurance that the difficulties are not too great, and that even longer journeys may be planned with every prospect of success. It might be well to point out how distinctly noticeable it was that no forest fires were sighted on those parts of the route where there was no travel, the few observed being along the Churchill River. All fires seen were reported to their respective districts. While in Prince Albert I was able to exchange ideas with the District Inspector of Forest Reserves in Saskatchewan, with respect to the proposed operation of aircraft on forest protection in his district. In conclusion it is the writer’s opinion there is no reason why such flights should not be extended much further into this country, provided the necessary fuel depots can be laid. I also consider that the operation fulfilled all the requirements of the Topographical Survey of Canada, as shown in the operation order.”

Athabaska Survey 1925

Worthy of mention were the Aerial Surveys north of Athabaska in 1925. The fourth operation was photography of 4,350 square miles from 12,000 feet, with a lens of 8 inch focal length, over the Fort Assiniboine sectional sheet. This operation presented some difficulties from the navigational view point, as an area of 1,100 square miles north of the Athabaska River had not previously been surveyed and the existing map was very inaccurate. One high hill in the district which made a good land mark was found to be six miles out of its mapped

position. An interesting innovation was made during this operation. The ground showed considerable differences in elevation and an effort was made to hold the height of the aircraft constant above the ground, so that the scale of the pictures should remain constant even though the elevation of the ground changed. The experience gained in this trial shows that where changes of ground level are not abrupt, no difficulty need be anticipated in holding a fairly constant height above ground level, provided the atmospheric conditions are fair. This operation was completed in especially good time, which for the whole area of 4,350 square miles, was 55 hours 50 minutes, or an average of almost 78 square miles per hour.

Aircraft Types

In the early years the flying in the sub-Arctic was carried out on H.S.2 L. flying boats with one or two large, twin-engined F.3's for fire suppression work. In 1923 a beginning was made to replace these obsolescent types by more modern aircraft and "Viking" amphibian flying boats were introduced in the Fall of that season. During 1924, all the work was carried out with this new type.

In 1925 to decrease the cost of the patrols, Avro seaplanes (single float type, with 210 horse-power Viper engines) for detection duties were added, the larger aircraft being held in reserve to transport fire fighting crews and their equipment. All bases and aircraft were fitted with wireless [which] provided adequate means of communication between the forest and Air Service headquarters at Winnipeg, and the three operating bases at Victoria Beach, Norway House and Cormorant Lake, and from them to aircraft in flight. During the season the sub-base at The Pas was moved to Cormorant Lake, as flying from the Saskatchewan River presented many difficulties. An excellent site was found on the shore of Cormorant Lake, some 40 miles northeast of The Pas on the Hudson Bay line.

Northern Manitoba and Hudson Bay Railway Survey

Another important aerial survey was that carried out over Northern Manitoba and the [Hudson] Bay Railway. The programme laid down in the beginning of the season was oblique photography over 30,000 square miles in eastern Manitoba and western Ontario, approximately 20,000 square miles in northern Manitoba, and over the Hudson Bay Railway as far as Port Nelson. Good progress was made with these operations but it was not possible to complete all because of time lost through bad weather. The "Viking" gave practically no trouble, though the load carried on most of the flights made was within a few pounds of the maximum permissible (5,800 pounds). With this



Figure 2-2: Hs2L flying boat.

load its performance is greatly reduced and much time is lost in gaining 5,000 feet—the working altitude. Every article of the equipment carried was carefully scrutinized, with a view to seeing that only essentials were carried.

Flying in an unsettled district such as this, where engine or other failure may mean a forced landing many miles from civilization, it is necessary to carry an emergency outfit in case the party may have to make the best of their way to civilization. The equipment cannot be reduced without risk. The alternative is to reduce the crew from four—pilot, navigator, photographer, and mechanic—to three, and train the mechanic to take the photographs. A navigator is essential in this country and Dominion land surveyors with long experience of travel in the north are carried in this capacity—not only to guide the aircraft over the maze of waterways from station to station and make survey notes to assist in the interpretation of the pictures, but to ensure the safety of the party in the event of their being stranded far beyond human habitation.

In 1921, with the co-operation of the Forestry Branch [of the] Department of the Interior, the Air Board established a station on the south end of Lake Winnipeg for the patrol of the forest areas lying east of the lake. The results of the detection and suppression patrols were so encouraging that the service was extended in 1922 and sub-bases were established on the end of Lake Winnipeg

at Norway House, and on the Saskatchewan River and Hudson Bay Railway line at The Pas. In 1925, the location on the latter base was changed to Cormorant Lake at Mile 43 on the Hudson Bay Railroad, and in 1926 the site of the southern base was changed from Victoria Beach to Lac du Bonnet.

The Viking flight reached Cormorant Lake on the Hudson Bay line on the 17 September, and from that date continued photographic flights covering an area of approximately 24,000 square miles by 5 October with the aid of continuous favourable photographic weather. The base was then moved to Norway House. Unfortunately, the weather changed and only one more photographic day was obtained before indications of the approaching freeze-up at Norway House forced a move southward to Winnipegosis on 13 October. From there further photographic flights were made for forest type mapping purposes. Cold weather and heavy snowfalls forced the abandonment of the operations, and on 16 October a return was made to Lac du Bonnet and finally to the Red River at Winnipeg on the 22nd.

On 27 October, one further photographic flight was made over the west coast of Lake Winnipeg from the Red River to the Icelandic River, using Winnipeg as a base. Operations then ceased for the year 1926, and the machines were withdrawn for winter overhaul.

Flights of Note - 1930

Two events which stirred the imagination in 1930 and [promised] to be aeronautical feats of Canadian Government flying during that season were the flights which two pairs of aircraft of the Department of National Defence made to the Northlands of the Dominion. The two expeditions left Ottawa on their respective missions early in July after considerable preparation and with considerable official attention concentrated upon each.

One was an extensive treaty flight in which fifteen stops were scheduled and a sum of \$25,000 was carried for distribution among the scattered Indian tribes of the Far North, approximately 4,000 Indians received treaty money. This flight was scheduled to visit the west coast of Hudson Bay to draw up agreements with two unattached tribes, so that all Indians in northern Ontario will have treaties providing them with gratuities and annuities. The equipment comprised two Bellanca seaplanes piloted by Flight Lieutenant Dave Harding and Flight Lieutenant R.K. Rose. At the first stop at Remi Lake, Dr. Mitchell of Sioux Lookout joined the party for official visits until Lake Joseph was reached where another physician took his place. The planes took H.N. Awrey of the Department of Indian Affairs and W.C. Cain, Deputy Minister of Lands and Forests for Ontario, for official purposes.

In 1929 the treaty flight travelled as far as Trout Lake and 627 Indians were brought under the treaty arrangement. In 1930 the scope of the Treaty of 1905 was completed. The work included the [allotting] of reservations¹ to two tribes, one at Sandy Lake and the other at Albany. C.C. Parker of the federal Department of Indian Affairs was also using the expedition for an inspection of the coasts of Hudson and James Bays and far into the Mackenzie River district. Inspector Parker travelled to the end of steel at Waterways from Edmonton and was picked up by the aeroplanes at Waterways. He opened a new agency at Fort Good Hope, which lies 12 degrees within the Arctic Circle where T.W. Harris was placed in charge. Lieutenant Colonel E. Forde, Acting Director of Signals, Ottawa, accompanied Inspector Parker in order to make an inspection tour of the wireless stations in the Arctic region. Colonel Forde continued a flight for this purpose while one machine brought Inspector Parker back to Remi Lake to carry out further inspections.

Another great flight was that headed by Flight Lieutenant F.J. Mawdesley, Staff Officer of Personnel, Civil Government Air Operations Branch, Ottawa, who was at the stick of a Fairchild 71 seaplane, accompanied by Acting Flight Sergeant H.J. Winny, RCAF, as pilot of a Vicker's Vedette flying boat. The two craft were expected to cover 25,000 miles from Ottawa and through the "barren lands" of the Northwest Territories for the purpose of inspecting gasoline and supply caches in the Far North and of opening up air routes in practically unknown areas. Announcement was made by Group Captain J. Lindsay Gordon, Director of Civil Government Operations, that this was a further step on the part of the Dominion Government in the development of the Northwest Territories. Corporal S.C. Dearaway, RCAF, was a passenger in the Vedette to undertake important photographic work in this respect. Accompanying Flight Lieutenant Mawdesley in the Fairchild was Colin S. McDonald, D.L.S., well-known surveyor and engineer, who was to carry out important preliminary work for the Government. Other airmen were in the party for special duties.

This was primarily a survey flight which [preceded] extensive air operations in the Arctic regions. Strip maps of little known air routes around the Mackenzie Basin, the Great Slave and Great Bear Lakes and in the wide stretch from Hudson Bay to the Mackenzie were secured, in addition a check-up of gasoline and repair caches was made, some of which had been established in out-of-the-way places by steamers and dog teams and also some by aeroplanes.

¹ *Editors' note:* Indian reserves.



Figure 2-3: Vedette flying boat

This flight left Ottawa on 6 July and proceeded to Aklavik via the Mackenzie River, then to Great Bear Lake and Coronation Gulf and on to Great Slave Lake. After a flight to Lake De Gras, the expedition followed the Thelon River to Baker Lake and Chesterfield Inlet, and thence north to Cape Fullerton, Wager Inlet, and Repulse Bay. Returning to Chesterfield the western shore of Hudson Bay was followed to Churchill, which was reached on 21 September. The flight from there to Ottawa was merely a matter of routine flying. In all, this detachment flew some 12,000 miles. Much of the flying was over unknown territory and unmapped routes, [and] 31,100 photographs were taken.

Personal Reports of Air Operations

The writer has attempted to give a general description of the operations carried out in the Canadian Sub-Arctic from 1921 to 1938, gleaned from official reports and documents. However, it is felt that a clearer picture can be obtained from the lips and pens of personnel actually engaged in these operations.

It is regretted that there occur gaps in the sequence of events and that the names of many RCAF officers and airmen have been omitted, but the impossibility of including each event and personality can be imagined. In the early days records were not always kept of all operations while in some cases those that were have been written off as “dead” and destroyed after the normal period of expended time. It is hoped, however, to provide an adequate picture of a cross section of operations and events of that period of RCAF development,

which contributed so much to the advancement of the present force and aided so greatly in the development of our vast Northland.

There follow several accounts of personal experiences, the first of these being of the first aeroplane flight into the Mackenzie River District in 1921 by E.G. Fullerton.

E.G. FULLERTON'S MACKENZIE RIVER FLIGHT 1920-21

Although this account does not describe an operation of the RCAF in the North, both pilots were World War I pilots and, in fact, their crew were overseas men too. E.G. Fullerton rejoined the Air Force within a year or two after this expedition and has recently retired with the rank of Group Captain. The inclusion of this account is felt to be fitting, as it is a classic report on the resourcefulness of pioneer pilots and crews in Canada's Sub-Arctic, told in E.G. Fullerton's own words:

"In the winter of 1920-21, the Imperial Oil Limited purchased two all-metal, 6 passenger monoplanes (cabin type) for operations to their then recently discovered oil field in the Mackenzie River district—located on the fringe of the Arctic Circle, near Fort Norman.

"At that time, the only transportation facilities that existed from Edmonton to Fort Norman were as follows:-

Summer: Railway from Edmonton to Fort McMurray (225 miles) Steamboat for remainder of journey to Fort Norman (a further 1,000 miles) via Athabasca River, Lake Athabasca, Slave River, with an 18-mile portage at Fort Fitzgerald, Great Slave Lake, and finally down the Mackenzie River - making a total distance of 1,200 miles. As the ice does not break up in Great Slave Lake until July each year, and freezes up again in October, the navigation season is very short - lasting only for about three months each year. To make the journey from Edmonton to Fort Norman, one-way, required from two to three weeks.

Winter: The same route was followed, but the steamboat portion of the journey had to be made by dog-team; and the trip to Fort Norman, one-way, took from a month to six weeks.

"With such slow and inadequate transportation facilities, having regard to the important oil developments that were then rapidly taking place in the North, it was only natural that the Imperial Oil Limited should look for a better and quicker method of transportation. As the evolution of commercial flying was then beginning, the aeroplane seemed to offer an immediate solution to the transportation problem; and hence the decision of the Imperial Oil Limited to try out this new method of travel.

“The flight route which we had decided to follow for our initial flight was: via the Peace River to Fort Vermillion, then north-northwesterly cross-country until the source of the Hay River was reached, thence via Hay River to Great Slave Lake, thence across the southwestern portion of Great Slave Lake to the mouth of the Mackenzie River, thence via the Mackenzie River to Fort Simpson and Fort Norman. This route represented a total air distance from our base at Peace River of a little over 800 miles.

“As the Imperial Oil’s decision to use aeroplanes had been made within the short space of a few months, no advance arrangements had been made for the establishment of fuel bases before the close of the navigation and shipping season to the North the previous September. Fairly reliable information, however, was available to the effect that a certain amount of motorboat gasoline and oil would be obtainable at most of the trading posts along our route and that we would more than likely find sufficient to meet our immediate requirements. We had found by practical experiment that our engines would function satisfactorily on ordinary low-grade gasoline after we had reamed out the [carburetor] jets to a slightly larger aperture. We therefore arranged to take with us an extra set of jets that had been so reamed. We realized, of course, that the use of non-aviation gasoline would almost inevitably result in increased carbon accumulation which, in turn, would necessitate more frequent top-overhauls, but we were prepared for this eventuality.

“There was only one portion of our route concerning which doubt was expressed as to whether sufficient fuel would be obtainable, and that was the first portion of Great Slave Lake. We therefore decided that our first flying operations would be to establish a fuel cache on upper Hay River by ferrying in a quantity of gasoline by air, to a point about midway between Peace River and Great Slave Lake—where a small trading post happened to be located. This could be done in one flight by the two aeroplanes, the distance being only 225 miles.

“We had decided that on all our flights to the North, the two aeroplanes should fly together, so that in the event of one encountering difficulties of any kind, such as a forced landing, the other would be able to render assistance. In this way, “all our eggs would not be in one basket,” as it were.

“The preliminary fuel-carrying flight to upper Hay River was carried out by both aeroplanes on the 22nd of March, 1921, with little incident. The landing was made on the ice of the upper Hay River. The gasoline which we were ferrying in was contained fifty 4-gallon cans, twenty-five being carried in each aeroplane in addition to one similar sized can of oil. When we were unloading this on the ice a few Indians began to assemble a short distance away. They viewed us with undisguised awe and wonderment, not unmixed with a trace of

suspicion. For some reason or other, they showed a definite disinclination to come very close to us or the aeroplanes, which (we afterwards learned from the Factor of the Trading Post) was because it was the first time they had ever seen an aeroplane and they feared we might be evil spirits of some kind. It was rather amusing, as a matter of fact, to later watch some of them examining our ski-tracks, especially where the skis had first made contact with the snow, pointing to the beginning of the marks, then to the sky—evidently convincing one another that the suspected “Evil Spirits” had unmistakably come out of the air—and then discussing the mystery in typically Indian fashion, punctuated by frequent grunts and gestures.

“Through the assistance of the Factor we were able to engage a dog-team and toboggan, together with a driver, to transport our gasoline and oil to a suitable cache, about 150 yards distant, which we had made arrangements to use. After our fuel had been safely stored, we remained only long enough to have some light refreshment, and in a short time we were again in the air winging our way southward. The return trip to Peace River was made without incident, the flying time being two hours and twenty minutes for the 190 miles. It might be of interest, perhaps, to mention that when carrying out an inspection of the aeroplanes after our return from this flight, we noticed two small holes in the fuselage covering one of the aeroplanes near the tail. These holes were about half an inch in diameter, one being situated at the bottom of the fuselage and the other at the top—directly opposite. We were completely at a loss to account for these holes, but as they closely resembled bullet holes, and were situated directly opposite one another, the only conclusion we could come to was that some of the superstitious Indians on the upper Hay River had fired at us as we passed over them. No damage had been done other than the holes, however, and these were soon patched.

“We were now ready to attempt the flight to Norman. Our party, by the way, was now augmented by a guest-passenger in the person of Sergeant Thorne, of the Royal Canadian Mounted Police, who arrived with a request from our head office to the effect that he be taken with us, if possible, as far as Simpson. Sgt. Thorne, who had spent many years in the North and knew the country like a book, had only recently “mushed” out from Simpson by dog-team, bringing with him an Eskimo prisoner. His dislike of the prospect of making the return trip by that slow and arduous method had inspired him to initiate action, which, to his surprise and joy, had resulted in his being permitted to accompany us, providing his additional weight would not prove prohibitive. The personnel of our forthcoming flight to the North now consisted of the writer, Gorman, Waddell, Hill, Derbyshire, and Sgt. Thorne.

“Two days later, March 24, at nine o’clock on a bright promising morning, “Rene” and “Vic” with their complement of passengers and complete emergency equipment, including ten day’s rations, took-off from the aerodrome at Peace River for “points North.”

“We had planned on reaching Great Slave Lake in two hops, landing at our intermediate cache on upper Hay River to refuel. We could very likely have made Great Slave Lake in one hop, weather permitting, but considered it expedient to arrive at that stage of our journey with as much fuel in our tanks as possible. The weather held good for about the first 100 miles, but after that the clouds began to get steadily lower. By this time we had reached the point on the Peace River where our course led across country to upper Hay River. The clouds had become so low and the visibility so poor, especially toward the north, that we considered it inadvisable to go on. Instead of turning back, however, we decided to turn east and continue along the Peace River to Fort Vermilion—a further distance of about 40 miles. Half an hour later, we were over Fort Vermilion and were preparing to land in a field near the Hudson’s Bay Company’s Trading Post. Both aeroplanes landed successfully, and as the weather conditions had turned much worse by now, with a blizzard commencing, we taxied into the shelter of a barn which was situated at one end of the field, and there we moored both aeroplanes securely to wait out the storm.

“As the storm showed no signs of abating, we decided to stay the night. We were able to find accommodation for all at the Trading Post, and consequently did not have to use our emergency equipment. We learned at the Post that sufficient ordinary gasoline was available to fill our tanks to capacity so we decided to take advantage of this, and thus [dispense] with the necessity of an intermediate landing at our fuel-base on upper Hay River. The storm continued for two days, but during this time we managed to carry out the refueling operations and to test out the motors on the low-grade gasoline. We found it necessary, as anticipated, to install slightly larger jets in the [carburetors], but following this, the engines functioned perfectly.

“On the afternoon of March 27, 1921, we took off from Fort Vermilion for Great Slave Lake, 200 miles straight across rather featureless country—so far as the maps of that time were concerned. Two hours and forty minutes later we were landing in thirty inches of snow, on the ice at the mouth of Hay River on Great Slave Lake. As a matter of curiosity, we made a point of measuring the depth of the snow at each new landing place. We parked the aeroplanes near the Hudson’s Bay Trading Post which is situated at this point. En route we had flown over the wonderful Hay River Falls, which is one of the great sights of the North. Although these falls are little known in civilization, they actually rival

Niagara Falls for magnificence and general impressiveness. Here, a beautiful stream, three to four hundred feet wide, plunges over a limestone ledge in a sheer drop of 106 feet at the upper falls, known as Alexandra Falls; a little farther on, it again drops for another 46 feet, known as Louise Falls. The tremendous potential hydro-electrical power which is contained in these falls, is only one of the many resources of the North Country that is awaiting development.

"Once more we were able to obtain sufficient fuel for our needs, but by the time refueling operations had been completed, it was too late in the day to proceed any farther on our journey. The Hudson's Bay Company's Factor here kindly offered to put us up, and we were pleased, of course, to accept.

"The following morning, we took off with Fort Providence as our immediate destination, our policy being to refuel-at every trading post along the route where fuel was obtainable. Our course was now toward the mouth of the Mackenzie. The weather was fairly good, on the whole, except for a headwind of about 20 m.p.h. Slave Lake weather, however, is noted for its treachery, and this occasion was apparently no exception, because by the time we had reached the mouth of the Mackenzie, the headwind which we had been bucking developed into a blizzard. As we wished to conserve our fuel as much as possible we decided to land on the ice here and wait until the blizzard had passed.

"After half an hour's wait, we were able to resume our journey. The mouth of the Mackenzie is from five to ten miles wide, gradually narrowing down to about two miles or less, and occasionally widening out to as much as three or four miles. On nearing the narrower portion of the river, we noticed that the ice was becoming more and more "hummocky" and soon the river was nothing but masses of jumbled contorted ice and snow that would spell positive disaster to any attempt at a landing thereon. For this reason, it was necessary to abandon the Mackenzie as a route and proceed more or less across country where innumerable small lakes and streams afforded safe landing facilities in case of emergency. On reaching Providence, we selected a field adjoining the Hudson's Bay Company's trading post and there made a successful landing in over three feet of snow. This was the deepest snow in which we had landed so far.

"Again we were fortunate in the matter of fuel and were able to fill up to capacity. On taking off, we encountered a certain amount of difficulty. The snow was so deep that we could not get up enough speed to get the aeroplanes into the air, because the skis were sinking too deeply into the snow. After two unsuccessful attempts, during which we could not reach more than 20 miles per hour, we taxied back to the starting point and there held a conference as to how the difficulty could best be overcome. The plan decided upon was for the five of us to walk abreast on our snowshoes up and down the stretch where we

proposed to take-off, until we had packed the snow down to a surface that would give better support to the aeroplane skis. In this task we were cheerfully joined by a number of local natives and with their assistance it was not long before we were ready to have another try at taking-off. This time our efforts were successful, and after a brief circle over the settlement to ensure that our motors were functioning satisfactorily, we headed directly toward Simpson. As this was Sgt. Thorne's goal, he was now full of anticipation and eagerly looking forward to his return home. His wife and the people of Simpson, not having the slightest intimation that he was returning by aeroplane, would naturally be expecting him by the same method by which he had left, namely, dog-team. He would, therefore, not be due for at least another month. No wonder he was chuckling at the surprise he was going to "spring" on them, especially on his wife! One hour and forty-five minutes after leaving Providence we were over Simpson in a light snowstorm and looking for a suitable place to make a landing. Here real trouble was encountered. To land on the Mackenzie was, of course, out of the question, owing [to] the extremely rough state of the ice, and landing areas elsewhere did not appear to be any too plentiful. However, a field on the edge of the settlement looked suitable, apart from a few snowdrifts, so a landing there was attempted. The "Vic" landed safely, but the "Rene" was not quite so fortunate. Shortly after settling, one ski suddenly broke through the heavy crust of a snow-drift, causing the aeroplane to swing around into the drift, smashing the ski and breaking the propeller. Neither Gorman nor any of the occupants of the aeroplane was injured. The snow was actually four feet deep, not counting where it had drifted and was heavily crusted in layers. Some disused dog-trails which crossed one portion of the field had frozen in such a way as to give the effect of hidden logs. The "Vic" had ridden the crusts until almost coming to rest, then gradually settled down into the snow almost to its fuselage.

"Sergeant Thorne's home was not more than about 100 yards from where we had landed. We will leave him just now and the furore of excitement in the settlement at his arrival and that of the aeroplanes, and continue with the tale of our flying experiences.

"Enquiry elicited the information that about a mile south of the settlement, on a small subsidiary channel (or "Snye," as they called it) of the Mackenzie, the ice was free from hummocks and would likely afford us better landing facilities than the field which we had used. Subsequent inspection of the Snye on foot having confirmed this information, it was decided that the "Vic" should be flown light out of the field to the Snye, where it could then be refueled and got ready for the final hop to the Norman oil well—250 miles farther north. As the "Rene" was now out of commission with its broken propeller and ski, it was

decided that the "Vic" should continue to Norman alone, leaving two of the party behind at Simpson with the "Rene." Assisted by a certain amount of man-handling, the writer managed to taxi the "Vic" to a far corner of the field to give maximum length of run for take-off. All possible load having been removed, the aeroplane showed less tendency to sink in the snow, and after attaining sufficient speed to ride up on the crust, the takeoff was made without any difficulty.

"On the flight from the pasture field to the Snye, the engine of the "Vic" did not perform very well, having developed a severe intermittent knock which subsequent investigation proved to a "pre-ignition" knock, due to excessive carbon accumulation in the combustion chambers of the cylinders. This premature accumulation of carbon resulted from using the low (non-aviation) grade of gasoline with which we had been obliged to fill up at Fort Vermilion, Hay River and Providence. The only remedy for this pre-ignition trouble was to give the engine a top-overhaul, viz., remove cylinders, scrape carbon therefrom, also from top surfaces of pistons, and grind the valves. This meant that the "Vic" could not make the hop to Norman until this work had been done on the engine.

"As the engine of the "Rene" had run much less time since its purchase than that of the "Vic" and consequently had less carbon accumulation, and moreover as the "Rene" required only a propeller and a ski to make it ready for flight, it was decided, rather than wait until the "Vic's" engine had been overhauled, to lend the "Rene" the propeller and a ski from the "Vic" so that the former could proceed to Norman without further delay. The "Vic" would remain behind at Simpson with the writer and mechanic, Derbyshire, who would meanwhile give the engine a top-overhaul.

"The change-over of propeller and ski to the "Rene" was accordingly made and the "Rene" was then flown "light" from the pasture field to the Snye where the "Vic" was now parked. The "Rene" was then loaded up in preparation for the flight to Norman and in due course, with Pilot Gorman in charge, accompanied by Surveyor Waddell and Mechanic Hill, the take-off was made. Misfortune, however, again dogged the "Rene" for she had hardly reached an altitude of more than about 50 feet when, for some reason, it stalled and crashed on the ice. Due partly to providential luck and partly to the sturdy all-metal construction of the Junkers aeroplane, none of the occupants was injured beyond a severe shaking up, and the only damage to the aeroplane was a broken propeller, slightly damaged wing and most of the undercarriage wrecked. By an amazing bit of luck the "Vic's" ski was found to be practically undamaged, which meant that the "Vic" could at least have her ski back and would then be minus only a propeller. It should perhaps be explained that an aeroplane in



Figure 2-4: Crash of the 2nd Imperial Oil Ltd. Company plane “Vic” at Fort Simpson. *NWT Archives.*

civilization which is minus only a propeller can be supplied with a new one in a very short time; but when the particular aeroplane happens to be situated some hundreds of miles from civilization then the deficiency amounts to practically an insurmountable difficulty because an aeroplane propeller is a most technical piece of equipment designed by specially qualified engineers and made only in factories by experienced craftsmen.

“At first the difficulty certainly appeared to us to be an insurmountable one, despite the reputation for resourcefulness on which we had prided ourselves. It was suggested that perhaps it would be possible to make a propeller, but this suggestion was immediately “pooh-poohed” as being quite ridiculous. Calm reflection revealed, however, the discouraging fact that the only alternative was to wait until navigation commenced in July, then send out to our base at Peace River for a new propeller (that was among our spares there) which would not arrive at Simpson until some time in August. As it was now April, this would mean that the five of us would simply have to “twiddle our thumbs” at Simpson for nearly five months—until the new propeller arrived by boat from Peace River in August. It took perhaps a day or so for the full significance of our predicament to be fully appreciated from all its angles and in its true perspective. During this time it was only natural that the almost preposterous idea of constructing a propeller at Simpson should be again reviewed, and this time in a more practical light, inspired by the hopelessness of our position, like a drowning man gasping at a straw. Gradually, as the result of one helpful suggestion and another, we came to the conclusion that the construction of a propeller would not be such an altogether impossible feat as it had at first appeared.

“Here was our plan. There was enough of the broken propeller available that could be pieced together to serve as a pattern from which templates could be made. We learned that the Catholic Mission had a few oak sleigh boards, 10 feet long and 7 inches wide, which was just about the size we needed to make a laminated propeller, except for being about an inch too narrow. This difficulty was solved by the eventual realization that by “fanning” the boards we could get the additional width needed. We further learned that moose-hide glue was available at the Catholic Mission, also a number of large clamps that would be suitable; and Father Decoux (who was in charge of the Mission) also informed me that we could have the use of the Mission workshop.

“The writer would like to record here that Father Decoux and all the Mission staff rendered us every possible assistance, as did likewise all the people of Fort Simpson. We were also particularly fortunate in being able to secure the services of a Mr. Johnson, who was a skilled carpenter and who was then employed, I believe, with the Hudson’s Bay Company, at Fort Simpson. Mr. Johnson rendered much valuable assistance but our mechanic, Bill Hill, was the leading light in the enterprise, and in fairness to him, he deserves the lion’s share of the credit for the success that the propeller turned out to

“Our various ideas about the propeller were consolidated and we soon got to work. The first step was to collect the broken pieces of the two propellers and try to assemble sufficient of them together with glue, to form one, or most of one, propeller, which could then be used as a pattern from which templates could be made. This was finally accomplished. The next step was to make the templates, a large number of which would be required. For this purpose, we were fortunate in being able to obtain a good supply of tin. The glued propeller was now placed on a smooth plank in the Mission workshop and hinged templates were made from the tin, spaced about 4 inches apart, along the entire length of the blade. As each template was finished, the bottom half (which conformed precisely to the shape and size of the underneath portion of the blade) was fastened to the plank, while the upper half, which was hinged, gave the exact shape and size of the upper portion of the blade. Then all the templates had been mounted on the plank in this manner, we had a “jig” into which the propeller which we proposed to make would have to fit perfectly. If we could succeed in accomplishing this most formidable and difficult task and laminate the boards so that our propeller would be strong enough to stand up to the severe stresses and strains to which it would be subjected, then there seemed to be no logical reason why the propeller would not function efficiently and fly us back to our base at Peace River Town.

“The next step was to plane a smooth flat surface on both sides of each of the seven oak sleighboards that we had been able to obtain from the Mission. In

the meantime, the moose-hide glue was being prepared by the Mission by boiling down moose-hide and hoofs. The laborious planing job was finally finished. The next thing was to prepare the boards for gluing by scratching the surface with very fine corrugations (for which a special tool was made) and then to proceed with the actual gluing and laminating of the boards. For this, it was necessary to have the workshop as warm as possible in order to allow the glue to flow and set properly, so the stove in the workshop was kept stoked up to maintain a temperature of about 80 degrees. The seven boards were duly glued together and the whole securely clamped. Fortunately, a sufficient number of clamps were available to permit placing them about a foot apart. It was decided to leave the clamped assembly undisturbed for about 36 hours (keeping the workshop warm meanwhile) by the end of which time we believed the lamination should be thoroughly set.

"While the above work was going on, the "Rene" was removed from the Snye to a place of safety and storage on the Island, where it would have to remain until an undercarriage, seaplane floats, propeller, etc., could be shipped in by boat.

"When the 36 hours had elapsed, the clamps were removed and the next step was to test the strength of the laminations. Obviously, if the gluing job was not 100 per cent reliable it would simply be a waste of time to proceed further with the job. A few small sections of the laminated assembly, which were surplus to requirements were sawed off and their strength tested by standing them on end and trying to separate the laminations with a hammer and chisel. To our immense satisfaction, the laminations proved without exception to be as strong as we could possibly wish for. So with great hopes and no little satisfaction at the success thus far achieved, we felt that we could now tackle, with a certain amount of justifiable confidence, the most difficult part of the job—that of shaping the pile of laminated boards into a practical propeller.

"It was indeed a very slow, laborious and tedious job, on which Hill and Johnson laboured for eight full days. The most meticulous care was constantly required to ensure that the work was not inadvertently spoiled in any way. While the manufacture of the propeller was in progress, Mechanic Derbyshire and the writer proceeded to give the engine of the "Vic" a top-overhaul; This work had to be done in the open just where the aeroplane was parked on the Snye as there were no buildings or tents of any kind available into which the nose of the aeroplane could be pushed. A small piece of tarpaulin was available, however, to protect the engine while we were working on it.

"It was now the 14th of April (1921) and as we were told that the ice usually went out of the Mackenzie about the last week in April, it meant that we did not have very many days left. Haste was, therefore, an essential of the first

importance. As our chance of getting away depended largely upon how successfully we could carve the seven laminated boards into a practical propeller, we had to make certain that we did not allow that subtle enemy “More Haste Less Speed” to creep into any stage of our work.

“An axe and an adze² were the tools used to commence the preliminary shaping of the laminated boards. These tools gave way to a drawknife and gradually, as the mass began to assume the shape of a propeller, the spokeshave stage was reached. Progress now became a little slower because the work had to be constantly [checked] with the templates to ensure that the correct shape was being maintained in every detail. As the templates were by now beginning to fit fairly closely, the spokeshave was discarded in favour of a large file and then finally and eventually the sandpaper stage was reached. So far so good. The next step was to fit the metal hub, and then check the propeller for balance. Unless the propeller were perfectly balanced, excessive vibration in the air would result which might be followed by serious damage to the propeller or engine. To balance the propeller, we fastened a large try-square to the wall edgeways, so that one angle was protruding straight out, and on to this we hung the home-made propeller from the hole in the boss. If the balance were all right, the propeller would take up a perfectly horizontal position. Luck was with us for the balance was not out more than a few degrees. This was corrected by filing a little more wood off the heavy blade until eventually a perfect balance was obtained.

“Still one more stage remained before we could consider the propeller complete, and that was the painting. In order to prevent the weather from getting at the laminations and undermining them, even for the comparatively short period of time it would take to reach Peace River, we considered it advisable to protect the surface in some way. For this purpose, although we were unable to obtain any varnish or shellac, we did succeed in finding a small quantity of old red paint of rather poor quality. This was better than nothing and in due course it was applied. It was now the evening of the eighth day since the propeller had been commenced. By the following day the propeller would be ready to fit to the engine of the ‘Vic’ for testing.

“The atmosphere among ourselves was now charged with anticipation and expectation and we could hardly wait until the following day to learn by a practical air test whether the homemade propeller was going to be a success or not. Predictions were many and varied, some of them by no means encouraging—such as “the propeller would sooner or later fly to pieces, and most likely sooner,” etc.

² An adze is an axe with a horizontal mounted and curved blade used for shaping wood.

“Finally our day of days arrived, and by noon the paint was dry enough to fit the propeller to the engine. While this was being done, as the weather was cold and wintry, the oil from the engine and water from the radiator, (which had previously been drained into four gallon cans) were being kept hot beside a big fire that had been lighted near by. When the propeller had been fitted, it was next tested for “track,” by driving a stake in the hard snow immediately beneath the propeller and positioned so that the tip of the propeller barely made contact with it, the other tip then being rotated until it became opposite the stake. If the “track” was perfect this tip should just make contact with the stake. We found that the “track” was out a little less than a quarter of an inch which was even better than we had dared hope for.

“Nothing more remained now but to pour the hot oil into the engine, the boiling water into the radiator, prime the engine and start up. The water drain-cock was kept open until the water came out about as hot as it was being poured in. The cock was then closed and the system filled with the boiling water. As this was being done the hot oil was poured into the oil tank and crankcase. In order to ensure quick starting, a priming mixture of either gasoline was injected into the cylinders. This was our customary procedure for starting up in cold weather, and we seldom had any difficulty in starting up even at temperatures of 40 degrees below zero. In cold weather, it was necessary that the engine be started quickly otherwise they would cool off in a few minutes and would have to be drained again to avoid freezing. Without the addition of ether to the priming mixture, the first power stroke of the engine, in severe temperatures, was not sufficiently powerful to rotate the crankshaft far enough to bring the next piston in line for its power stroke, with the result that the engine merely fired once and then stopped. This was the case, notwithstanding the fact that hot water and oil were first poured into the engine. At low temperatures, gasoline does not vapourize, of course, as readily as ether, or an ether-gasoline mixture.

“The engine having started at once, it was a great source of joy to the writer, who was sitting in the cockpit, to again hear the engine running smoothly and to note the propeller behaving just as if it were a regular factory product. The real test was yet to come however, when the engine was opened up to full revolutions. After the engine had been sufficiently warmed up, the throttle was gradually opened up to its fullest extent, while the aeroplane was “chocked” to prevent it moving forward. This was the crucial test. Would the propeller stand up under the strain of full revolutions? I held my breath, and I am sure the others did, as the engine roared. The engine was run at full revolutions for about half a minute and then gradually throttled down again. Throughout the test the propeller behaved perfectly. But before giving it a final test in the air, it

was decided to stop the engine and make a thorough examination of the propeller for any sign of cracking, splitting or strain. Nothing of this nature having been discovered, the only thing that remained to finally and conclusively prove the complete success of the propeller, was to take the aeroplane into the air and see how the propeller behaved under actual flying conditions. One or two of the "Die-Hards" who were afraid to be too optimistic predicted that if and when the aeroplane got into the air, the propeller might fail to stand up to the strain. For the air test, therefore, the writer took no passengers. The take-off from the Snye was made without the least difficulty and the aeroplane climbed in a perfectly normal manner. During the test flight, which lasted some twenty minutes, various manoeuvres were carried out and the aeroplane was flown at full speed, but in all of these tests the behaviour was normal in every respect. A landing was then made on the Snye, and the aeroplane taxied to where it had been previously parked. When the engine was stopped, a thorough examination of the propeller was again carried out but again with the same uneventful and gratifying results.

"To say that everybody was now highly elated would be putting it mildly. Any lingering doubts that had existed had by now been completely dispelled, and Hill and Johnson were acclaimed the heroes of the hour. Their skill, perseverance and resourcefulness under conditions that were by no means ideal, and which, at times, were even discouraging, had enabled them to produce a piece of highly technical equipment, that will for many years remain a monument to their ability and an inspiration, if not a challenge, to future pioneers of the Northern air trails. The making of this propeller is believed to be a feat which has never been duplicated before or since.

"To continue our flight to Fort Norman, under the present circumstances, especially when the break-up season was drawing so close, would obviously have been the height of foolhardiness. Our logical plan of action was to get back to our base at Peace River just as quickly as possible, before the ice on the river broke up and while we still had good ice on the Snye for a take-off. A characteristic of the Arctic and Sub Arctic is that once the spring season commences, it develops very quickly, due to the rapidly increasing hours of daylight. During the winter, in the Sub-Arctic, the nights are extremely long and the days extremely short and in the summer time, the reverse conditions prevail, especially, around June 21st, when there is continuous daylight. The short gap between winter and summer, and between summer and winter is very noticeable. At Fort Simpson around June 21st, the sun merely dips a short distance below the horizon for about a couple of hours, which is supposed to constitute "night," but there is still sufficient daylight remaining, for instance, to read a newspaper.

"It was now April 23rd, and we were told by the Fort Simpson people that a general break-up of the ice could be expected almost any day now, and that once the ice started to break up it would change, within perhaps only a few hours, to a broken and heaving mass, piling up here and there with resounding roars and crashes, into huge jams. These, in turn, would intermittently clear themselves, with more roaring and crashing, as the whole mass of ice moved slowly but steadily down-stream toward the Arctic Ocean. Preparations therefore proceeded apace for a hasty departure to our home base at Peace River Town. There was not sufficient daylight left that day to start our return flight but all arrangements were made to make an early start the following morning.

"In our flight from Peace River Town to Fort Simpson we had followed a rather circuitous route in order that we might be able to obtain supplies of gasoline and oil at the various trading-posts situated on this route. This route not only had the advantage of being clearly marked most of the way, but in the event of a forced landing that entailed walking out, we would not have to "trek" more than about 100 miles, at the most, to the nearest trading post and the route thereto would be one that could be easily followed. On our return flight to Peace River, however, it would be necessary to fly straight across country because, owing to the lateness of the season, landing facilities along the other and circuitous route would be definitely uncertain and hazardous. The direct cross-country route had the advantage of shortening the distance to just a little over 500 miles. We had fuel capacity for six hours continuous flying, and as we could obtain sufficient gasoline and oil at Fort Simpson to fill our tanks, the direct non-stop flight was the logical plan of action - despite the fact that by this route we would be, at times, as much as 200 miles from the nearest trading-post, which distance in the event of a forced landing, we might have to walk. Being optimists, however, we felt confident that such a thing as a forced landing was a very remote possibility, and that there would likely be sufficient snow remaining on our aerodrome at Peace River to permit landing with skis. Our cruising speed was 90 m.p.h. and, as we could carry enough fuel for six hours flying, it meant that in the absence of a head wind we could cover a total distance of approximately 540 miles. This, admittedly, was not leaving us much of a margin, but was sufficient, we thought, under the circumstances. As the country covered by the direct route was largely unmapped, very careful and accurate navigation would be required if we were to keep constantly on our course throughout the flight and reach our destination within the fuel endurance of the aeroplane.

"The arrangement now decided upon was to leave mechanic Derbyshire behind at Fort Simpson in charge of the "Rene", while the writer, Gorman, Waddell and Hill proceeded in the "Vic" to Peace River. As previously

mentioned, spares for the “Rene” were to be shipped in to Fort Simpson by boat when navigation opened in July.

“Everything was in readiness by that evening, April 23rd, 1921, for the hop-off to Peace River first thing the following morning. During the time that we were at Fort Simpson the entire [party] was “put up” at the hospitable home of our ex-passenger and very genial friend, Sergeant Thorne of the R.C.M.P., whose wife went to endless trouble to make us as comfortable as the limited facilities of the North Country would allow. This was to be our last night at Fort Simpson, and, as far as our thoughts were concerned, we were even now almost as good as back again at our base at Peace River.

“It was about 5 a.m. when we were aroused from our slumbers by an Eskimo who, with most commendable initiative, had come to tell us that the ice in the Mackenzie was beginning to break up. This disturbing news brought us all to our feet in almost one jump, and we slipped into our clothes with a speed that could only be rivalled by lightning. In a few minutes we were snowshoeing our way post haste to the “Vic”—which, as previously stated, was parked on the Snye about a mile from the village of Fort Simpson. (“Snye” is a northern term used to denote a subsidiary channel of a river which is separated from the main channel by an island—and, in this case, the island was that on which was located the village of Fort Simpson.) At this early hour of the morning, in April, it was comparatively dark (a sort of semi-twilight at this time of the year) although a friendly moon was doing its best to augment the light. We could distinctly hear the ominous rumbling and crashing of the breaking ice in the distance, and wondered whether we should arrive in time to rescue the “Vic”. The very thought of catastrophe to the “Vic” at this stage of the proceedings was just too disconcerting for words. When we finally arrived at the “Vic” we found that the ice on the snye was breaking up also but not quite so rapidly as on the main part of the river. Fortunately there still remained some 400 yards of smooth solid ice ahead of the aeroplane from which a take-off could be effected. Beyond this stretch there was more or less open water except for innumerable floating ice cakes. Even the remaining ice was steadily breaking up at the far end, and was consequently decreasing the length of our runway almost every minute. Not a moment was to be lost, and with feverish haste we prepared to start the engine.

“Having decided to fly to the lake we had to work quickly to get the aeroplane off the runway of river ice which was constantly getting shorter as

pieces broke off the lower end and drifted into the open water. The minutes which followed were anxious ones.³

"The water and oil had been drained from the engine the night before, into the large cans which we always carried with us, and we had fortunately chopped up a quantity of kindling and firewood the evening before, even laying the fire in readiness to heat the water and oil.

"In the present urgent circumstances, it was most essential that the water and oil should be heated before being put into the engine, not only to ensure quick and positive starting, but also to reduce the amount of preliminary running necessary before the throttle could, with safety, be opened to its fullest extent.

"One of us quickly applied a match to the previously prepared fire, while others hurriedly removed tarpaulin covers from the cockpit and engine of the aeroplane, unfastened mooring ropes and control lashings and got the aeroplane all ready to fly. A fierce fire under and around the cans, had the water and oil hot in a comparatively short time, but by the time we had poured these into the engine, our take-off runway had been reduced to the alarming length of barely 200 yards. It was now about 6:30 a.m.

"The writer climbed into the cockpit as the engine was being primed with an ether-gasoline mixture, and a few moments later the engine sprang into life. While giving the engine a brief preliminary run to ensure that the oil was circulating properly and that everything was functioning satisfactorily for the take-off, a trapper by the name of Jack Cameron, who lived at Fort Simpson,

³ *Author's note:* To give the reader some idea of the various articles of equipment that have to be carried in an aeroplane flying outside the boundaries of civilization, that is if the occupants of the aeroplane are to be prepared for all eventualities, the following is a list of the principal articles which were carried in the "Vic": eiderdown sleeping bag for each occupant; silk tent large enough to supply sleeping accommodation for all occupants; emergency rations for about one week, consisting of: tinned meat, hard biscuits, tea, sugar, tinned milk, chocolate, etc.; a few compact cooking utensils; haversacks, water bottles and matches; high-powered .22 rifle; ammunition; axe and hunting knife; fishing tackle; first aid kit, including splints, also a pint of brandy; snowshoes for all occupants; small toboggan; skis for all occupants; five four gallon cans for use when draining the water and oil from the engine, also for general emergency use; funnels and gasoline filters; blow-torch and soldering equipment and a supply of tools and wrenches to enable us to carry out any emergency repairs to the engine or aeroplane; spare parts for the engine, such as valves, valve-springs, rocker arm, gaskets, spark-plugs, magneto spares, etc. etc.; [and] various small parts for the aeroplane.

came along to watch the proceedings and to enquire whether he could be of any assistance to us. As Jack Cameron knew the surrounding country extremely well, was a thoroughly experienced and reliable woodsman, and had often expressed a very keen desire to fly, it was decided to ask him to accompany the writer on the flight to the near-by lake. He would prove a useful guide and helpmate on the “trek” back to Fort Simpson. Jack needed no second invitation, and in less time that it takes to relate he was in the cabin—snowshoes and all.

“The engine was now ready for the take-off and as I opened the throttle to its fullest extent we roared down the runway, which, now, had dwindled to a bare 100 yards—ahead of which was plain open water, dotted with floating ice cakes. The snow which was on the ice did not help us to gain flying speed quickly, and as we approached the end of the remaining ice I was not exactly sure that flying speed was ultimately going to be attained, but there was absolutely no alternative but to keep the throttle wide open and the tail well up until we had actually reached the end of the ice, for to attempt to force the aeroplane into the air before it had attained sufficient flying speed was simply asking for disaster.

“We shot off the end of the ice over the water, and I then eased the control column gently back. There was still some doubt as to whether she was going to remain in the air and, although I managed to resist the temptation to climb, she threatened, at first, to settle down into the water and, in fact, the heels of the skis actually did make a gentle contact with the surface. But, fortunately, we eventually gathered sufficient speed to keep her definitely air-borne and I was soon gaining height at a gratifying rate. That was about as close a call as one could expect to have and get away with. I can assure anyone it was decidedly thrilling while it lasted although Jack Cameron thought it was great fun.

“However, here we were gaining height steadily, and the engine functioning perfectly as the snow and ice-clad wilderness spread itself out before us. Beneath us lay the mighty Mackenzie, now a mass of moving ice jams and occasional open stretches of water, the shore lines marked by strewn masses of ice. The small nameless lake, which was our destination, could now be discerned on our left, and we made a turn in that direction and headed straight for it. The five miles distance to it was covered in a few minutes and we were soon gliding down to a landing on its smooth snow covered ice.

“The “Vic” settled gently on to the snow, and gradually came to rest. I could not resist heaving a sigh of relief that the “Vic” was once more safe and sound. Jack got a great kick out of his first flight, and was thereafter a staunch booster of flying, both as a sport and as a quick and comfortable means of getting from here to there.

“Our next step, after taxiing the “Vic” to a sheltered spot on the shoreline, was to drain the water and oil into the cans which I had taken with me, moor the aeroplane securely, lash the controls, and prepare for the five mile “trek” back to Fort Simpson, to assist in bringing out the equipment that we were to take with us and in order that I might guide the remainder of our party to the “Vic’s” parking place. As there was still some three feet of snow on the ground, it was necessary to wear our snowshoes. Owing to the muskeg nature of the ground, which was covered with a thick growth of small trees and underbrush, and to the fact that there was no trail which we could follow to Fort Simpson, the going was extremely difficult and slow. Although the distance was barely five miles it took us about 3-½ hours of hard steady going to get to Fort Simpson, which included a rather thrilling crossing of the snye by leaping from one ice-cake to another, at which Jack Cameron was particularly adept and in which his guidance and experience proved helpful.

“We rejoined the remainder of the party at Sergeant Thorne’s house, just in time to share in a meal which was then in progress and of which, by now, we were both rather badly in need.

“All our equipment had been prepared in bundles and haversacks in readiness to be taken out to the “Vic.” So, after we had finished our meal at the hospitable Sergeant Thorne’s, we said hurried goodbye to them and all the people of Fort Simpson, most of whom, by now, on hearing that we were about to leave, had come over to wish us “bon voyage.” We did not overlook Father De Coux, the Mission staff, Johnson, the factors of the trading companies, the Indian agent, Cameron and a number of others who had rendered us valuable assistance.

“On the trek to the “Vic” we could not use a sleigh to transport our equipment, as there was no trail and, as previously explained, the intervening country was too impassable. Everything, therefore, had to be carried on our backs. The snye, which a short time previously had been packed with ice, could now be crossed by boat and this was done with the assistance of Jack Cameron, who afterward took the boat back to the Fort Simpson side. The remainder of the journey was, of course, a slow and arduous one, which can be deduced from the fact that it took us nearly four hours to cover the four miles.

“When we arrived at the lake and at last reached the “Vic,” twilight was falling, so we immediately made camp for the night and prepared a meal to appease the appetites our trek from Fort Simpson had developed. We had shot three partridge during the trek and these provided a most palatable addition to our meal. Having erected our silk tent, we prepared a “mattress” floor of soft pine branches, on which we spread our eiderdown sleeping bags. Comfortable beds for the four of us were now ready. The tent was of rectangular shape and

we left the front portion of it almost entirely open so that the interior of the tent might be exposed to the heat from the enormous fire which we had prepared a few feet in front. The axe, which we always carried with us, came in most useful on this occasion. Needless to say, all hands slept very comfortably that night, except for taking turn about to add fuel occasionally to the camp fire.

"The next morning, we were awake bright and early, and as breakfast was being prepared on the edge of the campfire the water and oil from the engine were being heated and the "Vic" got ready for her forthcoming flight to Peace River. After a breakfast of [bacon] and beans, bread, butter and coffee (which we had brought with us from Fort Simpson, specially for this occasion) we got the engine of the "Vic" started and everything in readiness for the take-off. The writer was at the controls, with Surveyor Waddell in the seat alongside to assist in navigating, while back in the cabin were Gorman and Hill. We had practically full tanks of gasoline, the tanks having been filled to capacity at Fort Simpson before the take-off from the snye.

"The amount of fuel that had been consumed in flying over to the lake was negligible. The lake afforded a good long run for a take-off and despite the heavy load and the home-made propeller, we had no difficulty in getting the "Vic" into the air. There was practically no wind to assist in getting off, but no wind, with the long trip that was ahead of us, was much better than a head wind. Although the sky was overcast, there was sufficient ceiling to allow us to climb to about 1,000 feet.

"We had taken off at 8 a.m. The course which we had decided upon was south-southwest by compass for about 150 miles until we picked up the sixth meridian, then (as the sixth meridian passed within about 25 miles of Peace River and was a swath about four feet wide cut through all timbered sections of the country) follow the sixth meridian southward for about 325 miles until reaching familiar country near Peace River. Surveyor Waddell assured us that the sixth meridian was cut all the way from the Mackenzie to near Peace River.

"The route chosen was not exactly a straight course to Peace River (which we would have preferred, in view of the limited fuel supply for the long distance to be covered) but the slight divergence entailed only an additional 25 miles, and it was considered to be well worth the extra mileage in the added accuracy which it afforded to our navigation. The country touched by a perfectly straight route was very incompletely mapped and this, combined with the large magnetic variations of about 40 degrees, rendered the navigation of the route rather risky within the limits of our fuel endurance.

"We had calculated that it would take us one hour and forty-five minutes to reach the sixth meridian by the course that we had chosen. It was obviously most important that, toward the end of that time, we should be on a

particularly sharp lookout for this meridian because, if we were to pass it unawares, it might mean that a certain amount of valuable time and distance would be wasted in obtaining our exact bearings. At the end of the calculated time, we happened to be over rather heavily wooded country, so had no difficulty in picking up the meridian, which we now followed for the remaining leg of the journey. It was a simple matter following it, for it stretched like a path before us, except over open stretches of country and lakes. Then one had to be careful to keep exactly on the course by means of the compass until again picking up the meridian over closed country.

“The remaining flight to Peace River was more or less uneventful, except for occasional periods of very low clouds and a threatened attack by a huge eagle. The eagle apparently resented intrusion in his domain and, mistaking us for a rival bird, swooped down exceedingly close to attack us, but at the last moment fortunately changed his mind and zoomed off. The whole thing happened so suddenly that Gorman and Hill, who were in the cabin, did not have time to get hold of the rifles. Much to our relief, however, the eagle decided not to renew his attack, and we eventually lost sight of him. Had he broken our propeller we should have been forced to land in rather rough country, about 200 miles from the nearest trading post.

“When we had got to within about 200 miles of Peace River, we noticed that spring was much more advanced than in the North; snow was becoming less and less, and all the rivers were running. The lakes, of course, were still frozen over. As we got still nearer we noticed, with grave concern, that there was no longer any snow on the ground. Where were we going to land an aeroplane fitted with skis? We had planned to land on our aerodrome but without any snow on the ground how was a landing to be effected without damaging the aeroplane! Even the lakes that we were now passing were open around the edges and the remaining ice looked none too good. After weighing the pros and cons of various possible solutions, we unanimously decided that the best plan of action was to try a landing on Little Bear Lake (which is a small lake about 15 miles northwest of the town of Peace River, and is the nearest lake thereto) as we felt confident that, despite the advanced state of spring, the long severe winter we had had would render lake ice sufficiently strong to support an aeroplane. The plan was to fly over our aerodrome and drop a message to our cook-caretaker (whom we had left there in charge of the aerodrome) telling him that we were going to land on the ice at Little Bear Lake and for him to send out a pair of wheels by car—so that we could exchange our skis for wheels, and thus be able to fly to the aerodrome and land.

“As we passed Little Bear Lake en route to Peace River, we noticed that the ice was blackish, and that a considerable amount of open water existed all

around the edges, in which a number of ducks were disporting themselves. This, admittedly, was not exactly reassuring for the plans which we had made, but in the light of our knowledge of ice thicknesses that winter, we did not feel that it constituted a strong enough argument to warrant a change in our plans. At any rate, I figured we could test the strength of the ice without necessarily being obliged to actually land. (This I proposed to do, by making a rather heavy preliminary “tail-up” landing on the ice, while maintaining a sufficient margin of speed, assisted by the engine, to enable me to get safely away again in the event of the ice proving unsafe).

“The aerodrome was now in sight a few miles ahead of us. Up to now we had been flying continuously for exactly six hours, and our fuel supply had dwindled to almost the zero mark. A check-up of our remaining gasoline supply revealed the rather disconcerting fact that in about twenty minutes we should be running out of gasoline. We had left at 8 a.m. and it was now 2 p.m.

“Arriving over the aerodrome, we lost no time in throwing down the message to our cook-caretaker (Charlie Woodman) who lived in the annex to the hangar, and who rushed out on the aerodrome on hearing the noise of our approach. After a brief circle over the hangar to see that the message was really picked up, I turned the nose of the “Vic” toward Little Bear Lake—15 miles distant.

“When dropping the message, we had noticed a Junkers monoplane on the aerodrome, of the same type as our own, parked near the hangar; and we were very curious to know to whom it belonged and for what purpose it was there. It did not belong to us, and to our knowledge, the only Junkers monoplanes in Canada were the two belonging to the Imperial Oil Ltd: “Vic” and “Rene.”

“As we had other much more important matters to occupy our thoughts at this particular time, we dismissed the question and concerned ourselves with our forthcoming landing at Bear Lake. It wasn’t many minutes before we were over Bear Lake and I had shut off the engine and was turning into the wind for a landing. During the first part of the approach I brought the “Vic” down at her normal gliding speed, crossing over the open water, which extended out for perhaps fifty yards around the edge of the lake, and headed for what looked to be the strongest part of the ice. On nearing the surface, I opened the throttle to about half way, at the same time increasing speed to a safe margin for the preliminary “ice test” landing. According to plan, I allowed the “Vic” to make a rather heavy contact, being ready to open the throttle and get away again if the ice should suddenly show signs of giving way. The solid manner in which the ice responded, assured me that I need no longer have any apprehensions in the matter. I therefore closed the throttle and guided the “Vic” down to a normal landing.

“When our wheels and gasoline arrived at the lake, they would have to be sent out from the shore by boat and then transferred to the ice. As there was not much we could do in the interim, we decided to drain the gasoline tanks in order to see just what quantity was remaining. We did not see how there could be more than, say, a gallon or two at the most, because according to the fuel gauges and our calculations of the rate of consumption, we had taxed the fuel supply pretty well to its limit. We were rather unprepared, though, for the surprise which we got when we found the total quantity of gasoline remaining was a bare half gallon—enough for about four or five minutes more flying.

“We had not long completed the gasoline check, when the noise of an approaching plane, coming from the direction of Peace River, attracted our attention. On looking up we saw it was a monoplane; and as it drew closer we observed that it was a Junkers monoplane like our own—evidently, we concluded, the aeroplane that we had seen on our aerodrome. It circled over our heads and then shut off its engine and prepared to make a landing on the ice not far from where we were parked. The pilot used good judgment in not landing too near us, for the combined weight of the two aeroplanes might have proved too great a strain for the ice. It was fitted with wheels, and when it came to rest, to our surprise out of the cabin stepped the portly figure of J.L. Larsen—the New York agent from whom the Imperial Oil Limited had purchased “Vic” and “Rene.” After a hearty exchange of greetings, Mr. Larsen informed us that he had flown up from New York a few days previously, partly with a view to seeing how we were getting along with our Junkers, and partly in the hope of being able to find a further market for his aeroplanes. On hearing that we were due back almost any day from our extended trip to the Mackenzie River, he had decided to wait at Peace River for our return. He said that when we dropped the message, he was in our hangar talking to the caretaker, and on learning that we required wheels and gasoline, he at once arranged to fly these out to us in the cabin of his machine.

“Both aeroplanes then took-off for Peace River and about 10 minutes later we were gliding down to a landing on our home aerodrome. Thus ended our eventful first flight to the Mackenzie River district.”

[F/L A.F.] SANDY MACDONALD 1931

“No. 3 General Purpose Detachment was organized in the Spring of 1931 with the following personnel: Flt. Lt. A.F. MacDonald, O.C.; F/O P.B. Cox, Pilot; Cpl. Lunney, Rigger; L.A.C. Green, Fitter-Camera Operator; L.A.C. Harvey, Fitter-Camera Operator; and a civilian cook, A.R. MacPherson. The Detachment was equipped with two new Bellanca Pacemaker seaplanes, the first ships in Canada to have water rudders fitted to the Edo floats.

“Delivery of the aircraft was taken at Rockcliffe and the planes ferried to Fort Churchill Man., arriving there on July 1st. A base was established at Tavanne, N.W.T. in an abandoned fur trading post on July 21st when Mistake Bay was sufficiently clear of ice to land.

“The operation was right angle oblique photography of the west coast of Hudson Bay and lakes and inland waterways in an area bounded roughly by Maguse Lake, Kaminuriak Lake, Rankin Inlet and Hudson Bay.

“The Detachment was accompanied by a party of Land Surveyors, headed by Dr. L.J. Weeks, who established ground controls within the area while the photographic operation was in progress.

“Photography commenced on August 9th. In all, approximately 1200 photo miles were flown to complete the operation.

“Many errors were found to exist on the existing Marine Mercator’s Chart of Hudson Bay when the photographic flight along the west coast was undertaken. Photographic navigation of the inland areas was undertaken by working from a rough sketch map drawn by Mr. Guy Blanchet while flying over the area the previous season. This was found to be surprisingly accurate, considering the method of its construction.

“Right angle oblique photography was a new experiment, hence little or no previous data was available with regard to camera or flying technique. The Detachment devised its own camera mounts and worked out the required geometry while waiting at Fort Churchill for the ice to clear out of the Bay.

“The flying was done at an altitude of 5000 feet above sea level (A.S.L.) following the shorelines of lakes and rivers at a distance of one half mile off the near shore. The greatest difficulty encountered was that of calculating the time interval between exposures to give the desired overlap, since the aircraft were constantly turning, following the winding courses of rivers and tortuous shorelines of lakes. Readings from a sensitive aneroid barometer were required to be recorded with every exposure, which, together with line navigation kept the pilots pretty thoroughly occupied during their photographic flying.

“In addition to aerial photography, the Detachment did a considerable amount of freighting and the usual assortment of odd jobs which fall to the lot of anyone with an aeroplane available in regions such as those. A substantial tonnage of freight was flown in to Beverley Lake from Baker Lake for Mr. W.H.B. Hoare of the Northwest Territories Department to establish a new post at the former point. The Detachment’s arrival at Baker Lake was coincidental with that of Colonel Lindberg on his historic flight across the Barren Lands to Japan in a long range Lockheed Sirius—a flight that later was to set up the rumble of some international repercussions.

“On July 31st the Detachment arrived back at Tavanne from an operation further down the coast to learn that one of the Survey Parties was a week overdue getting in from the Barren Lands. A two day search of the area was undertaken, using Eskimo observers in the planes, featured by numerous forced landings on glassy water, due to overheating of the Wright J6 engines in the Bellancas. The engines had not been fitted with oil coolers. When the survey party were finally located they were highly indignant that anyone had so much as dared to consider them lost!

“On August 3rd Flying Officer Cox had a “mysterious” forced landing while returning from a photographic flight which, at the time, no one was able to explain. His engine commenced to slowly lose power and finally died completely, forcing him down, but later, upon thorough investigation revealed no indication whatsoever as to the cause of failure. If present day knowledge of carburetor icing at high temperatures had then been understood it would have put at rest the baffled minds of the entire Detachment.

“On August 5th the Detachment flew the first official air mail flight from Chesterfield Inlet to Fort Churchill. The mail load carried included cachets forwarded for this specially authorized flight from almost every corner of the globe.

“Weather conditions encountered during the season along the west coast and inland as far as the Detachment aircraft penetrated were anything but pleasant for contact flying. Visibility below safe visual flight rules (V.F.R.) limits was all too frequently experienced. Fog banks have an unpredictable habit of rolling in and [blanketing] the coast line with little or no warning. The Detachment’s aircraft were not radio equipped and in those days no radio navigation aids existed in the Territories. Under conditions of lowered visibility navigation was fairly difficult, since the magnetic compass was quite useless. Generally, one had to rely on sun diagrams - which were, of course, equally useless when the sun was obscured. Navigation was for the most part a matter of map reading from the somewhat vague and sketchy maps available, and reliance on that “sixth sense” which Providence has knowingly provided for juveniles, [alcoholics,] and those who fly.

“The problem of safe anchorage for seaplanes is a serious one in the Sub Arctic. Little shelter is available in the Barren Lands and winds of up to 70 miles velocity are not unknown. The year previous to the Detachment’s operation, a number of aircraft were operated by mining exploration companies in the same area. The wrecks of some of their aircraft were observed along the coast. Rumour has it that one ship was lifted off the water in a gale and carried seven miles inland.

"The photographic operation was completed on Sept. 1st. A series of 8-mile-to-the-inch maps of the area has since been developed and printed. The Detachment flew out to Fort Churchill on Sept. 3rd to proceed to Riding Mountain Manitoba on a vertical photographic mission."

[G/C SHELDON] COLEMAN 1936

"Serving as Adjutant of Winnipeg Air Station, RCAF, in 1936, I was detailed to carry out a transportation flight into the Arctic to convey Mr. Christenson of the Department of Indian Affairs on an inspection trip of Indian Reservations.

"My aircraft was a Fairchild 71B No. 644 with a Pratt and Whitney Wasp B engine and Fairchild floats. My crewman was LAC J.A. Forty. We proceeded from Lac du Bonnet. On 14th July we were forced down by low clouds and smoke at Berens River. However, conditions improved and we were able to proceed to Cormorant Lake. The next day we proceeded to Ft. McMurray via Lac La Ronge but were forced back to Flin Flon by smoke and remained there overnight. The following day we proceeded to Ft. McMurray where we stayed for one day and having embarked Mr. Christenson proceeded via Goldfields and Camsell's Portage to Fort Chipewyan. On the 19th of July we proceeded to Fort Smith where Mr. Christenson was a guest of the Northwest Territories Council. The aircraft and crew returned to the RCAF sub-base at Fort Fitzgerald where they remained until the next day.

"On the return from Fort Fitzgerald to Fort Smith a forced landing was necessary due to a failure of the fuel pump. It was fortunate that the engine failure did not take place until we were below the Rapids of the Drowned but it was necessary to be taken under tow to Fort Smith. A new fuel pump having been installed, we proceeded with Mr. Christenson to Fort Resolution. At Fort Resolution we moored to an anchor in the bay but as evening approached the weather appeared ominous and not being positive of the holding ground the aircraft was moved to a small river north of the settlement where it was beached. During the night the wind reached gale proportions and the seas were extremely rough. One Canadian Airways aircraft dragged its moorings and was wrecked on the shore. The next day the wind having abated we proceeded to Fort Reliance and based at the old Dominion Aerial Explorers camp which was then occupied by Nos. 7 and 8 RCAF Photo Detachments commanded by F/L L.E. Wray and WO R.C.C. Rutledge respectively, who were engaged in photography north of Aylmer Lake. During the long summer evening we were able to visit



Figure 2-5: Campsite Fort Reliance

the site of Fort Reliance and were greatly impressed with the natural beauty of this northeastern end of Great Slave Lake.

“On the 22nd the flight departed Fort Reliance and after a brief stop at Fort Rae and Slemon Lake proceeded to Cameron Bay on Great Bear Lake. The stop at Fort Rae was eventful due to the hazardous seaplane harbour and many rocky shoals which were almost a wash. At Slemon Lake we found that the water was very low and the aircraft had to be refuelled by floating gasoline drums out approximately fifty yards from shore. Also at Slemon Lake was our first encounter with a serious black fly and mosquito menace which accompanied us until we reached Aklavik. The flight remained at Cameron Bay for two days which gave us an opportunity to visit the radium mines at Port Radium and meet Stanley McMillan, since Wing Commander RCAF, who was engaged in transporting pitch blende from Cameron Bay to Edmonton. On the 23rd of July the flight proceeded to Fort Norman and except for a forced landing due to weather in McVicar Arm where the insect menace was terrific we arrived as per schedule.

“At Fort Norman during the night a spring freshette of the MacKenzie arrived filling the river with timber, not in the form of logs but in the form of complete trees and it was fortunate that we had moored our aircraft in a cove at the mouth of Great Bear River. On the 26th of July we proceeded north down the river with our destination Aklavik. However, climatic conditions forced us to land at Fort Good Hope. During this flight we had an opportunity of flying

through the Ramparts which is a deep, narrow, limestone gorge with banks approximately 200 feet high dropping sheer into the water. At this point the river is constricted to a width of approximately fifty yards and quite swift, approximately 8 knots. The landing area at Fort Good Hope is immediately below the Ramparts and a small creek running east of the river affords ample protection for float aircraft.

"We were required to remain at Fort Good Hope for two days where we were the guests of Constables Mast and Anderson of the RCMP. On the 28th the flight proceeded to Fort MacPherson where we visited the graves of the RNWMP personnel who were lost on the famous Dawson Patrol about 1907. These Mounted Police personnel were eventually found by Assistant Commissioner Denny [La Nauze] who has only recently retired from that famous force. The same evening the flight proceeded to Aklavik.

"At this time of course there was only approximately a half hour of twilight and flying was possible without night equipment twenty-four hours of the day. At Aklavik the personnel of the flight stayed with Inspector Carleigh, RCMP, whose servant was an Eskimo who was under sentence of murder but as we gathered at that time the laws governing murder by Eskimos were tempered by their own tribal laws and hence this Eskimo was only required to do sentence as a servant for a period of two years. It was gathered that the fact of being employed as a servant was a great disgrace to his tribe and it appeared that to him the sentence was very harsh. On the 30th of July the flight was taken to Herschel Island where we met Bishop Fleming and were shown the gallows on which two previous Eskimo murderers were hanged. The weather during this stage of the trip was extremely hot running up to about 850 and the humidity was comparable to that experienced in southern Ontario. During the flight to Herschel Island the Beaufort Sea was clear of ice approximately 40 miles from shore. The same night we returned to Aklavik. The next morning at one a.m. the flight proceeded from Aklavik to Arctic Red River where we were entertained at breakfast by the monks of the monastery and sipped some excellent native wine. After breakfast the flight proceeded to Fort Norman for lunch and to Fort Simpson where personnel stayed with Dr. Trusdale. The flight was held at Fort Simpson for two days awaiting word of the flight of Sir James MacBrien and FA Gordon who had proceeded from Simpson to Dawson City and were at that time unreported. However, on the 3rd of August word was received that they had landed at Fort Providence and had proceeded towards Winnipeg. On the 3rd of August the flight proceeded from Fort Simpson with landings at Fort Providence and Hay River to Fort Fitzgerald and the next day proceeded to Fort McMurray. On the 5th of August the flight proceeded from McMurray to Cooking Lake near Edmonton where Mr.

Christenson was disembarked to proceed to Ottawa by train. It was the intention at this time that the flight proceed direct from Cooking Lake to Winnipeg via Waskisieu and Cormorant Lake. However, instructions were received to remain at Edmonton pending the results of a search for a lost aircraft northeast of Great Slave Lake.

"Cooking Lake was the official conclusion of what was then termed Operation Inspector which had completed 5457 miles in 60 hours and 23 minutes and had consumed 1311 gallons of gasoline which is 21.5 gallons per hour or 4.5 miles per gallon. Outside of the failure of the fuel pump at Fort Smith and the replacement of brushes on the starting motor at Fort Simpson no mechanical difficulties arose. During this entire trip the crew were in summer dress and when not in the insect area were in shorts and shirts with sleeves rolled and open at the neck. It is important to note in view of subsequent events that the aircraft or crew were not equipped for operations at low temperatures.

"In 1936 I had the misfortune to become lost in the Barren Lands, the details of which are given further on in this book."

WRAY 1936

"During August 1936 while a photographic detachment of 5 Bellanca Seaplanes was operating in the barren lands based from Reliance and from Aylmer Lake under command of A/C Ray a Bellanca aircraft piloted by F/S Horner failed to return from a normal flight over the Barrens. The remaining 4 aircraft of the detachment searched for the missing aircraft for 3 days and found it forced-landed on a very small lake in the barrens with a completely unserviceable engine and a hungry crew. During the next 24 hours arrangements were made to set the crew and some assistants up at this lake with an attempt to salvage the air-craft. During the flying of supplies in and out another aircraft disappeared piloted by F/S Tourgis. A search by the remaining aircraft was instituted to find the second missing aircraft and twenty-four hours later it was found on another small lake with the engine torn apart on failure of the master rod.

"During the period of the searches survey parties associated with the photographic detachment were at their observing sites and were to have been supplied with food regularly every three days. However, owing to the pre-occupation of the crews and aircraft with the searches, regular supply to the surveyors had to be suspended. The surveyors reported each night on their radio sets and each time reported that they could last out for another 24 hours. Then the survey party found them they were surviving on one cup of crumbs taken from the bottom of their food boxes. New engines for the forced-landed aircraft



Figure 2-6: Fort Reliance

were sent in by Fairchild Seaplanes from Winnipeg, the second of which was flown by G/C Coleman (then flight lieutenant) with LAC Fortey as crewman.

“After delivering the engine to one of the disabled Bellancas and remaining with the repair crew until the aircraft was serviceable, G/C Coleman and LAC Fortey started their return trip to Reliance, on the east end of Great Slave Lake. During this flight they became lost and the third search was then instituted. After 7 days of most extensive search flying with no result, the searching crews were beginning to reach exhaustion, gas supplies were nearly depleted and food supplies were running very short. Freeze-up had commenced on all of the small lakes in the barren lands and the strain of flying over this unmapped country without reliable navigation instruments at this time of year was intense.

“Additional aircraft were sent in to the search, both from RCAF and commercial sources. The search continued with some of the aircraft undertaking the search sorties while others were utilized to haul gas and food into the operating bases.

“Progressively the search was widened until on its completion it was found that an area equivalent to all of Manitoba and half of Saskatchewan had been minutely searched. During the 4th week of the search it was thought likely that Coleman and Fortey would not be found alive if they were ever found but it was determined to continue until complete freeze-up blocked the means of flying. Plans were made to continue the search on skis after the freeze-up had been completed. On the 30th day Coleman and Fortey were found on Point Lake



Figure 2-7: F/L Coleman, LAC Fortey, and Mat Berry at Privation Lake.

approximately 100 miles east of Great Bear Lake, miraculously still alive but probably only with 2 or 3 days of life left to them.

“They were flown out of Point Lake by Matt Berry, a famous commercial and bush pilot who was flying with the searching party at the time. Coleman and Fortey were hospitalized in the RCMP cabin at Reliance under the care of a medical officer who had been brought in to look after both the searchers and the lost if they were found. Despite the fact that freeze-up was expected in 48 hours it was decided that an attempt would be made to fly out the undamaged aircraft in which Coleman and Fortey had been lost. Two Bellancas were loaded with fuel supplies and extra crew were flown to Point Lake and were dropped there with the first heavy snow fall of the season. The following day, despite the blizzard condition it was realized that the aircraft had to take off or be frozen in completely. In consequence an attempt was made. After flying for approximately 150 miles in extreme blizzard condition, the three aircraft were forced down on Lac de Gras upon which they made a successful landing despite being badly iced-up throughout. The aircraft were kept afloat in the blizzard for approximately 6 hours until two of them managed to reach the lee shelter of a small island. Icing conditions were so bad that the crew members of these two aircraft had to assist each other to remove frozen garments by chopping and cutting them from their bodies.

“Shelter was obtained that night by digging a tent in the snow drift and a measure of warmth was found from the use of a [plumber’s] thaw-pot. The following morning at dawn the third aircraft was seen, still afloat, tied up to a rock in the lake. The crew of this aircraft, despite extreme exposure, were able to taxi the aircraft over to the other 2 aircraft on the island. The remaining gas from all 3 aircraft was placed into one aircraft and it was estimated that this night enable the one aircraft to reach the main base at Reliance. The remaining crews saw this aircraft leave with some concern because they realized if it did not reach their destination that they were frozen in for the winter with very little in the way of protection and food. The aircraft did reach Reliance and further gas supplies were flown to the 2 stranded aircraft in Lac de Gras to everybody’s relief all the aircraft were brought together at Reliance, for the first time since the first aircraft disappeared in mid August. Upon reaching the first settlement of Fort Smith, local inhabitants had some difficulty in determining which of the men had been those who had been lost in the barren lands owing to the emaciated condition of the entire personnel.

“It is desired to make mention of the amazing fortitude of Coleman and Fortey in their determination to stretch out their rations to last as long as possible. Had it not been for this ruthless determination they would never have been recovered alive. The story of their 30 days which will be obtained from other sources is an amazing tale of will power, frustration, hope and suffering.



Figure 2-8: Fairchild and campsite (far right) at Privation Lake.

The following is an extract from F/L Coleman's diary and is a record of the weather experienced at Privation Lake,⁴ North West Territories:

Wednesday, 19th August 1936

Wind NW @ 5mph. Clouds cumulus at 2000ft. 9/10. Scattered showers. Barometer falling. Altimeter set at 1000 ft. at 1500 hours. Temperature 55° F. Rain during evening and night.

Thursday, 20th August 1936

Wind W @ 5 mph. Clouds moving from NE @ 20 mph. Altimeter 950 ft. @ 1500 hours. Barometer rising slowly. Temperature 55° F. Cumulus clouds at 2500 ft. 9/10. Thunder storms to NE.

Friday, 21st August 1936

0900 hours. Ceiling unlimited. Wind nil. Temperature 450° F. Small cumulus clouds on southern and eastern horizon. 1500 hours. Cumulus clouds 7/10 at 2000 ft. Wind SW @ 10 mph. Altimeter reading 875 ft. Barometer rising. Temperature 57°F. Clear visibility unlimited, Deviation here between 30° and 35° E.

Saturday, 22nd August 1936

0900 hours. Altimeter 775 ft. Barometer rising. Temperature 480F. Wind South @ 2 mph. Alto Stratus 10,000 ft. 9/10. Clear visibility unlimited. 1500 hours. Altimeter 800 ft. Barometer falling slowly. Temperature 60°F. Wind SW @ 15 mph. Cumulus numbus at 2000 ft. 6/10. Fracto cumulus 10,000 ft. 6/10. Scattered rainstorms. Visibility 20 miles.

Sunday, 23rd August 1936

0930 hours. Altimeter 900 ft. Barometer falling slowly. Temperature 45°F. Wind WNW @ 10 mph. Cumulus clouds 1500 ft. 9/10. Fracto allus at 20,000 ft 3/10. Clear visibility 20 miles. 1615 hours. Altimeter 200 ft. Barometer steady. Temperature 52°F. Wind NW @ 25 mph Cumulus at 2000 ft. 7/10. Fracto cirrusat 20,000 ft. 7/10. Clear. Visibility unlimited under the clouds.

Monday, 24th August 1936

0930 hours. Altimeter 825 ft. Barometer rising. Temperature 45°F. Wind SSW @ 15 mph. Cumulus clouds 2000 ft. 3/10. cirrus clouds 20,000 ft. 2/10. Clear. Visibility unlimited under the clouds. 1600 hours. Altimeter 875 ft. Barometer falling. Temperature 53°F. Wind SW @ 12 mph. Cumulus clouds 1500 ft. 9/10. Clear. Scattered showers. Visibility 30 miles.

⁴ Point Lake, NWT. Lat 65° N Long 111° W.

Tuesday, 25th August 1936

0930 hours. Altimeter 1000 ft. falling. Temperature 50°F. Wind SSW @ 8 mph. Cumulus clouds 2000 ft. 1/5 north. Cumulus clouds 4000 ft. completely overcast. Scattered rainstorms. Visibility 20 miles. 1530 hours. Altimeter 1025 ft. falling slowly. Temperature 60°F. Wind SSW @ 15 mph. Cumulus clouds 4000 ft. 4/10. Curus clouds 20,000 ft. 4/10. Clear. Visibility unlimited.

Wednesday, 26th August 1936

Altimeter 900 ft. Barometer rising. Temperature 45°F. Clouds cumulus @ 1500 ft. 10/10. Wind WNW @ 5 mph. Completely overcast. Visibility 15 miles. Appears to be clearing slowly. 1630 hours. Altimeter 825 ft. Barometer rising. Temperature 50°F. Clouds cumulus 2000 ft. 9/10. Wind NNW @ 7 mph. Clear. Visibility unlimited. Getting colder and clearing slightly.

Thursday, 27th August 1936

Altimeter 750 ft. Barometer rising. Temperature 50°F. Clouds completely overcast at 1000 ft. Wind NE @ 5 mph. Mist and light rain. Visibility two miles. 1630 hours. Altimeter 750 ft. Barometer steady. Temperature 50°F. Cumulus clouds 1000 ft. 10/10. Wind N @ 5 mph. Clear. Visibility 5 miles. Appears to be clearing in SW. The weather cleared in the evening and it looked as though the depression had past but see tomorrow's report.

Friday, 28th August 1936

0930 hours. Altimeter 750. Barometer steady. Temperature 40°F. Clouds cumulus at 1000 ft. Completely overcast. Wind NNW @ 3 mph. Rain. Visibility 4 miles. 1900 hours. Altimeter 600 ft. Barometer rising. Temperature 45°F. Clouds cumulus 2000 ft. 9/10. Wind NNE @ 3 mph. Clear. Visibility 15 miles. Clouds rising and clearing slowly.

Saturday, 29th August 1936

1015 hours. Altimeter 750 ft. Barometer falling. Temperature 40°F. Wind NE @ 3 mph. Clouds cumulus at 1000 ft. Completely overcast. Scattered showers. Visibility 2 miles. 1725 hours. Altimeter 850 ft. Barometer falling. Temperature 59°F. Wind N @ 3 mph. Clouds cumulus at 3000 ft. 6/10. Clear. Visibility 30 miles. Wind @ 3000 ft. S 15 mph. Scattered thunder storms, clearing to south. Unfit for search.

Sunday, 30th August 1936

0830 hours. Altimeter 950 ft. Barometer falling. Temperature 50°F. Wind ENE @ 3 mph. Clouds Fracto cumulus at 6000 ft. 5/10. Clear. Visibility unlimited. Scattered rain storms to south. 1530 hours. Altimeter 1000 ft. Barometer falling. Temperature 65°F. Wind ENE @ 8 mph. Clouds fracto altus

at 15,000 ft. 2/10. Clear. Visibility unlimited. Wind @ 15,000 ft. S @ 25 mph. Fit for search.

Monday, 31st August 1936

0930 hours. Altimeter 1000 ft. Barometer steady. Temperature 52°F. Wind ENE @ 12 mph. Clouds cumulus at 1500 ft. 9/10. Clear. Visibility 5 miles. Clearing slowly. 1800 hours. Altimeter 950 ft. Barometer steady. Temperature 58°F. Wind NE @ 7 mph. Clouds cumulus at 1500 ft. 9/10. Clear. Visibility 20 miles. Clear to south. Has been clear with ceiling of 15,000 ft. from 1100 hours to 1600 hours. Unfit for search.

Tuesday, 1st September 1936

0830 hours. Altimeter 900 ft. Barometer steady. Temperature 51°F. Wind E @ 8 mph. Clouds cumulus at 2000 ft. 9/10. Clear. Visibility 10 miles. 1530 hours. Altimeter 950 ft. Barometer steady. Temperature 55°F. Wind ESE @ 10 mph. Clouds cumulus at 2500 ft. 6/10. Clear. Visibility 20 miles. Fracto cumulus at 15,000 ft. 4/10. Fit for search.

Wednesday, 2nd September 1936

0945 hours. Altimeter 1100 ft. Barometer falling. Temperature 50°F. Wind ESE @ 2 mph. Clouds cumulus at 700 ft. 10/10. Haze and fog. Visibility 2 miles. Sun appears to be breaking through a low flying bank of thin clouds. Unfit for search. 1830 hours. Altimeter 1200 ft. Barometer falling. Temperature 60°F. Wind nil. Clouds cumulus at 2000 ft. 1/10. Clear. Visibility unlimited. Ceiling unlimited except for a few scattered clouds. The finest evening so far at this location. Fit for search.

Thursday, 3rd September 1936

0900 hours. Altimeter 1300 ft. Barometer falling. Temperature 45°F. Wind E @ 3 mph. Clouds Cumulus at 1000 ft. Completely overcast. Rain. Visibility 1 mile. 1630 hours. Altimeter 1350 ft. Barometer falling. Temperature 50°F. Wind E @ 3 mph. Clouds cumulus at 1500 ft. 3/10. At 6000 ft. 6/10. Completely overcast. Rain. Visibility 5 miles. Unfit for search.

Friday, 4th September 1936

0830 hours. Altimeter 1400 ft. Barometer falling. Temperature 50°F. Wind nil. Completely overcast. Low clouds, 200 ft. Fog and rain. Visibility 400 yards. 1600 hours. Altimeter 1300 ft. Barometer rising. Temperature 53°F. Wind NE @ 5 mph. Clouds cumulus at 1000 ft. Completely overcast. Fog and mist. Visibility 2 miles. Unfit for search.

Saturday, 5th September 1936

0800 hours. Altimeter 1050 ft. Barometer rising. Temperature 45°F. Wind SE @ 5 mph. Clouds cumulus at 6000 ft. 10/10. Clear. Scattered showers. Visibility 10 miles. Low clouds at 1000 ft. 2/10. Coming from SE. Appears to be clearing slowly. 1700 hours. Altimeter 1000 ft. Barometer rising. Temperature 40°F. Wind SSW @ 5 mph. Clouds cumulus at 200 ft. Completely overcast. Fog and rain. Visibility 400 yards. Unfit for search.

Sunday, 6th September 1936

0900 hours. Altimeter 1000 ft. Barometer steady. Temperature 38°F. Wind W @ 3 mph. Clouds Cumulus at 1500 ft. 10/10. Scattered showers. Visibility 5 miles. 1630 hours. Altimeter 1000 ft. Barometer steady. Temperature 45°F. Wind WSW @ 5 mph. Clouds cumulus at 1500 ft. Completely overcast. Clear. Visibility 10 miles. Unfit for search.

Monday 7th September 1936

0800 hours. Altimeter 1000 ft. Barometer steady. Temperature 40°F. Wind WSW @ 10 mph. Clouds cumulus at 1800 ft. 8/10. Clear and cold. Visibility 20 miles. Appears to be turning colder and clearing. 1615 hours. Altimeter 975 ft. Barometer steady. Temperature 43°F. Wind W by S @ 5 mph. Clouds cumulus, fracto cumulus at 1500 and 7000 ft. 6/10 and 8/10. Scattered. Showers. Visibility 10 miles. Appears to be clearing. Wind up to 15 mph in gusts with showers. Unfit for search.

Tuesday, 8th September 1936

0800 hours. Altimeter 950 ft. Barometer steady. Temperature 40°F. Wind at @ 2 mph. Clouds fracto altus at 12,000 ft. 3/10. Clear. Visibility unlimited. 1630 hours. Altimeter 950. Barometer steady. Temperature 50°F. Wind nil. Clouds cumulus at 3000 ft. 8/10. Clear. Visibility unlimited. A fine day. Still clear to southward. Fit for search.

Wednesday, 9th September 1936

0915 hours. Altimeter 900 ft. Barometer steady. Temperature 40°F. Wind nil. Clouds cumulus at 8000 ft. 6/10. Clear. Visibility unlimited. Fit for search. 1630 hours. Altimeter 850 ft. Barometer rising slowly. Temperature 45°F. Wind NE @ 5 mph. Clouds cumulus at 3000 ft. 7/10. Scattered rain storms. Visibility 20 mileS. Unfit for search.

Thursday, 10th September 1936

0800 hours. Altimeter 800 ft. Barometer rising slowly. Temperature 40°F. Wind N @ 5 mph. Clouds fracto altus at 20,000 ft. 8/10. Fog on horizon. Clearing. Visibility 5 miles. Low lying mist on hills which is clearing as the sun

rises. Scattered rain throughout morning. 1600 hours. Altimeter 750 ft. Barometer rising. Temperature 39°F. Wind N @ 15 mph. Clouds cumulus at 1500 ft. 7/10. Scattered rain and snow. Visibility 20 miles between storms. Unfit for search.

Friday, 11th September 1936.

0730 hours. Altimeter 600 ft. Barometer rising. Temperature 35°F. Wind N @ 20 mph. Clouds cumulus at 500 ft. 8/10. Cold and scattered showers. Visibility 5 miles. Snow during night on the hills. Unfit for search. 1730 hours. Altimeter 575 ft. Barometer rising temperature. 35°F. Wind N @ 5 mph. Clouds cumulus at 2500 ft. Completely overcast. Clear and cold. Visibility 20 miles. Fit for search.

Saturday, 12th September 1936

0930 hours. Altimeter 600 ft. Barometer steady. Temperature 30°F. Wind nil. Clouds cumulus at 1000 ft. Completely overcast. Snow. Visibility 1 mile. Snowed all night. 1800 hours. Altimeter 550 ft. Barometer rising. Temperature 35°F. Wind N @ 10 mph. Clouds cumulus. 1000 ft. E00. Scattered snow. Visibility 2 miles. Scattered snow all day. Unfit for search.

Sunday, 13th September 1936

0830 hours, Altimeter 500 ft. Barometer steady. Temperature 35°F. Wind. NNW @ 4 mph. Clouds cumulus 2/10 at 1500 ft. Completely overcast at 4000 ft. Clear. Visibility 30 miles. Scattered snow during morning. Unfit for search. 1700 hours. Altimeter 550 ft. Barometer steady. Temperature 40°F. Wind N @ 3 mph. Clouds alto stratus at 8000 ft. 3/10. Clear. Visibility unlimited. Clear at approximately 1300 hours. No clouds until 1600 hours. Clouds on horizon and clearing northward. Fit for search.

Monday, 14th September 1936

0830 hours. Altimeter 750 ft. Barometer falling. Temperature 33°F. Wind N by E @ 3 mph. Clouds alto stratus at 15,000 ft. 3/10. Clear. Visibility unlimited. 1600 hours. Altimeter 850 ft. Barometer falling. Temperature 42°F. Wind NNE @ 8 mph. Clouds nil. Clear. Visibility unlimited. Strato altus clouds at 15,000 ft. to southward. Clearing. Fit for search.

Tuesday, 15th September 1936

0800 hours. Altimeter 900 ft. Barometer falling. Temperature 30°F. Wind N @ 15 mph. Clouds cumulus at 500 ft. Completely overcast. Snow. Visibility 1 mile. Cleared toward noon but still cumulus clouds 3000 ft. to south. Unfit for search. 1700 hours. Altimeter 900 ft. Barometer steady. Temperature 36°F.

Wind WNW @ 15 mph. Clouds cumulus at 3000 ft. 2/10. Clear. Visibility unlimited. Fit for search.

Wednesday, 16th September 1936

0800 hours, Altimeter 1000 ft. Barometer falling slowly. Temperature 30°F, Wind W @ 15 mph. Clouds cirrus at 20,000 ft. 1/10. Clear. Visibility unlimited, Fit for search.

“In flying over the barren land areas in the early days when accurate navigation instruments were unavailable, Use was made of the esker formations which are found widely spread over the barren lands. These eskers are very prominent ridges of clear gravel and sand which rise above the surrounding terrain and which lie generally in an east and west direction. Owing to their bright yellow colour and their protuberance from the rest of the terrain they are very prominent landmarks which can be seen from great distances from the air. After flying in the unmapped barren land areas in periods of doubtful weather when the sun was not available upon which to base a mental sense of direction, these eskers were often a saviour in enabling the pilots to orient their directions.’ it should be borne in mind that a large part of this flying over hundreds of miles of the barren lands was done entirely upon topographical memory of the aircrew.

“A/C Wray has flown over most all the Canadian Arctic during his photographic, bush and transport operations, his most recent flights dealing with transport. The majority of his work covered the barren lands north of 60° between Hudson Bay and the Mackenzie River with less detailed work in the southern Yukon, Quebec and Labrador. In 1937 A/C Wray worked on a combination of transport and photography east of Hudson Bay, in 1938, Central Quebec, and 1940, Northern British Columbia. He was in Labrador and Newfoundland in 1942 on reconnaissance and transport duties and has since been in and out of Labrador several times.

A/C A.D. ROSS 1929

Introduction

“At the end of February, 1929 I finished my Ab Initio (student) Pilot’s Course, received my wings, and a posting to RCAF Station, Jericho Beach, Vancouver, for a Seaplane Course. This course lasted seven weeks, and included instruction and practice on an Avro 504N single float seaplane, DH Moth seaplane and Vickers Vedette flying boat, and was of little use to one destined for northern flying operations. On conclusion of the course I was transferred to



Figure 2-9: Vickers Viking.

Winnipeg Air Station. On arrival in Winnipeg I found I was detailed as OC, Transport Flight, which consisted of four Vickers Viking FBs and one Fairchild FC2 seaplane, each aircraft manned by a pilot and crewman. The Flight did not operate as such at all, as all aircraft worked independently on operations, detailed by the [Commanding Officer], Winnipeg Air Station, and my sole duty as Flight Commander was to prepare a report on its operations at the end of each year. Early in May I was sent to Lac du Bonnet Sub-Station to take over my aircraft and crewman, and to receive instructions on the Viking.

“At Lac du Bonnet I found that my crewman was to be LAC (ex F/Sgt) T.F. (Plugs) Cooper. Enquiries revealed that Cooper had been a Sgt in the RFC and RAF, and a F/Sgt in the RCAF. He had just rejoined the Service after two years with Western Canada Airways. I discovered also that Cooper was one of about six people in the country who really knew how to handle, coddle, and get service out of the Rolls-Royce Eagle IX engines with which the Viking was underpowered.

Operations 1929

“My first operational task was in company with other green and junior officers to build a corduroy road through the muskeg from the Air Station to

the highway. At odd intervals, and seemingly as a reward for my labours, I managed to acquire about three hours' dual and about two hours' solo flying on the Viking, during which I demolished one lower tail plane in a rough landing.

"During the first week in June I received instructions to pick up Mr. H.F. Lambart of the Topographical Surveys Branch, and his party of three, and to transport them to Pukkatawagon on the Churchill River, via Cormorant Lake Sub-Station as soon as ice conditions permitted. This party was to carry out a survey of Indian Reserves along the Churchill River, the south end of Reindeer Lake, and between Brochet on Reindeer Lake and Lac du Brochet. I worked with this party throughout the summer, moving them from place to place and keeping them supplied.

"Following the trip to Pukkatawagon I returned to Cormorant Lake, where I was based until near the end of November.

"During this period I carried out a considerable number of forestry patrols as it was a bad fire year, and from time to time it was necessary to use every available aircraft. In addition, I carried out quite a few transportation flights carrying various Government officials all over Northern Manitoba and Saskatchewan, and equipment for photographic flights, working in the Reindeer Lake, Granville Lake, Foster Lake, and Cree Lake areas.

"During the month of July I made my first attempt at being a photographic pilot, one which came to a quick and untimely end. I was detailed to replace temporarily a pilot of a photo flight who had been injured in a crash. The flight was operating in the area between Oxford and Split Lakes and based at Thicket Portage on the Hudson Bay Railway. We were using Vedette FBs in which were installed a doubtful batch of Lynx engines.

"I had carried out what had seemed a successful day's photography on my first flight, and on the return trip to base encountered almost simultaneously a line squall and the loss of two grasshopper springs in the engine. I attempted a forced landing in the Nelson River, the nearest bit of water, and rather narrow in this area. Owing to the turbulent air and lack of power and skill, I found myself in the position of having to crash on the windward and rocky shore or into the water. I chose the latter, near the shore. Neither my crewman or myself were injured, aside from minor bruises, but our emergency equipment and cameras were all submerged and we were unable to salvage them. To add to our discomfort, heavy rain commenced as soon as we got ashore and continued for almost seventy-two hours. Towards the end of this period a party of Indians appeared on the scene, gave us bush tea and offered to take us out to the railway via canoe. They told us of one portage a mile long, but neglected to mention another, twelve miles long through heavy wet muskeg. The ferocity of the mosquitos was matched only by our language and feelings towards Indians in

general, when half way along this portage the weather broke and we saw aircraft looking for us. However, we arrived back at base in due course somewhat sadder and wiser, and after a rest I returned to Cormorant.

"I carried out six so-called mercy flights during the summer and fall of this year, during one of which I beat the stork to the Pas by twenty minutes!

"During September we received word at Cormorant that Col H.D. McAlpine, President of Dominion Explorers Limited, and party were missing on a flight between Baker Lake and Great Bear Lake, via Bathurst Inlet and Coronation Gulf. All available RCAF and civil aircraft commenced a search for the missing aircraft. The search grew more intense as the winter drew closer, and it became necessary to replenish stocks of fuel used in the search. Two other pilots and myself were employed therefore in flying gasoline and oil to Lac du Brochet and Fond du Lac, which were used as bases for search operations. While returning from the last of these trips almost at the end of October I ran into a heavy snow storm and was forced to land on Sisipuk Lake on the Churchill River. The storm kept us there for two days, at the end of which we had to break ice out to open water in order to take off and return to base.

"The latter series of flights was the first time that "Preston" was tested as an aero engine coolant in Canada. It proved quite satisfactory, in fact without it the operations could not have been carried out owing to continuous sub-freezing temperatures at this time of year.

"I remained at Cormorant Lake until the end of November, when I was detailed to the Civil Aviation Branch for employment as an Airways Engineer in charge of construction on the air route then under development between Winnipeg and Regina. I remained on this job for three months, and then after a short leave returned to Cormorant about 1st of April, 1930.

Operations 1930

"I was again detailed as OC Transport Flight, Western Air Station, for this year, but once again through unforeseen circumstances was to spend a lot of time on Forestry Operations, which included an inspection trip over a large portion of Northern Manitoba by the Honourable John Bracken, then Provincial Premier.

"During June I made several transportation flights to various parts of Northern Manitoba and Saskatchewan, and again took Mr. Lambart and his party to the Reindeer Lake area to finish the work they had started the year before.

"About the end of the month F/L A.L. Morfee, OC Cormorant Lake, took sick and I assumed command of the base.

"The month of July proved exceptionally busy. I carried out 112 hours' flying and spent only three nights and one day at Cormorant trying to cope with correspondence and station administration.

"One of my first jobs during this month was to move the supplies and equipment of a Photo Flight from Cormorant to Stoney Rapids and later to Camsells Portage on Lake Athabaska, and to keep them supplied. This flight was later to photograph the Chipman River, Selwin and Wholdia Lake areas. To assist them I made three trips from Fond du Lac to Wholdia Lake to find a suitable spot for a base, and to move in gasoline. I also made two exploration flights from Wholdia Lake, One down the Dubawnt River to Carey Lake, and the other down the Kazan River as far as Lake Angikuni, where I ran into bad weather and ran out of gas taxiing to shore back at Wholdia, having been semi lost in this [map-less] area.

"Sandwiched in between these operations for the photo flight I was instructed to carry out a Treaty Flight. At Norway House I picked up an Indian Agent, his clerk, and an RCMP Sgt, and several thousand brand new one dollar bills. We paid treaty and held court at Island Lake, God's Lake, Oxford House, and Split Lake. It was a most interesting experience, lasting a week. The benefits (?) of civilization and Christianity upon the Indian were not evident judging by the number of criminal cases heard and the pagan rites practiced, sometimes an hour after a missionary had held church services. I had the doubtful honour of being offered by an Indian his daughter in exchange for a ride in my aeroplane or a gallon of gas (value \$6.00). In addition, I was given the name "Pemi-tou-haugen-Okimow" (Cree spelling doubtful) meaning "Chief of the flying gasoline canoe."

"Following this operation and during August I spent most of my time on Forestry work, including two search-rescue flights. During this month we received our first Vancouver F13 as a replacement for the tail-wagging, low flying Varunna. This aircraft proved ideal for the job, being able to carry large loads into and out of small lakes. Albeit, the spectacle and odour of sixteen smoke begrimed Indians sitting in the cabin chewing and spitting tobacco was not too good for the morale or temper.

"In September F/L Morfee returned to duty, and I set out to move my survey parties and photo flights out of the country before freeze up. The photo flight operating in the Fond du Lac – Wholdia Lake area was transported through to Lac du Bonnet, and from there sent on its way east with a sigh of relief! (FA Carr-Harris, OC)

"While returning from a flight, towards the end of the month my old Viking decided it had had enough. The bottom collapsed while I was landing at Cormorant, and we descended rapidly into twelve feet of water. Cpl Cooper,



Figure 2-10: Fairchild 51.

who was still my crewman and standby, received a broken nose, while I was merely pained, grieved and surprised.

“The latter event ended my flying for the season, except for several unsuccessful attempts to get an overloaded Fairchild FC2 off slushy ice to transport it-to Winnipeg during November.

“During the middle of October a sudden and heavy three-day blizzard swept across the country. Through herculean efforts we managed to get two aircraft out of the water during the height of the storm, but the remainder were frozen in and had to remain there until the ice was thick and firm enough to haul them out on top of it. The only benefit of this storm was the appearance of thousands of caribou in our area, which had been driven south by the storm. We hunted and fared well on caribou steaks for a while.

“At the middle of December I went off on leave to Winnipeg, at the end of which, reluctantly, I was transferred to Camp Borden.

Operations 1940

“Early in July 1940, while I was OC, 5 Bomber Reconnaissance Squadron, based at RCAF Station, Dartmouth, N.S., I received instructions-from the Air

Officer Commanding, Eastern Air Command, to carry out a survey of the Northern tip of Newfoundland and the Labrador Coast north of Newfoundland to 55° N, with the object of selecting a suitable site for a joint Naval and flying boat base. My squadron was equipped with Stranraer flying boats at this time.

“On the 17th of July, 1940, accompanied by F/L F.S. Carpenter as 2nd Pilot and Navigator, and crew, I proceeded to Gander, Newfoundland, and thence to Botwood. The next two days were spent reconnoitering and photographing various bays, fiords and possible base sites in Northern Newfoundland, using St. Anthony as a base. The next four days were spent exploring and photographing the Labrador Coast, including Hamilton Inlet. The return trip was made via Botwood, Garia Bay and Sydney, N.S.

“Reports were submitted on all possible sites to HQ, EAC. This trip ended (temporarily, I hope) my ventures into the land of rocks, bush and muskeg.”

S/L P.E. Sorenson

“In September, 1936, while a member of No. 8 General Purpose Squadron, I received word that I was to be a member of a detachment proceeding to Fort Smith in the North West Territories for the purpose of Meteorological survey work. The detachment consisted of one Fairchild “71” aircraft and three RCAF personnel, namely, Sergeant R.I. Thomas, Pilot and NCO (now W/C), the writer, Sergeant P.E. Sorensen, Pilot (now S/L), and Sergeant L.S. Thompson, Fitter (now F/O).

“The detachment took off on floats from the Winnipeg River and proceeded to Fort Smith via Cormorant Lake, Peter Pond Lake, McMurray and thence to Fort Smith. At Fort Smith we were met by a fourth member of our party, Mr. Gerald Gill of the Meteorological department of the Department of Transport.

“Full details of the assignment were then discussed and plans made to carry it through to a successful conclusion. In brief the assignment was this: to study the movement of the upper air masses and collect as much data as possible for future study by the meteorological department. The RCAF was required to make daily flights up to 20,000 feet if possible, and gather such data as humidity of the air, [millibar] pressures⁵ and temperatures at every 500 foot level.

“To accomplish this, various instruments were installed in the aircraft. An Aerometeorograph was mounted on the wing along with a wet and dry bulb thermometer. (It may be mentioned that the Aerometeorograph used by us was the same instrument used by Admiral Byrd at the South Pole and loaned to the

⁵ *Editors' note:* A millibar is one thousandth of a bar, the unit of atmospheric pressure equivalent to 100 pascals.

Canadian Government by the U.S.A.) Inside the aircraft were mounted various thermometers and [Millibar] Barometers for visual readings.

"In the meantime, Mr. Gill with our assistance, set up his instruments, which consisted of Barometers, Thermometers and a series of thermocouples mounted on a 100-foot high steel mast erected by the detachment. These thermocouples mounted every ten feet on the mast were for the purpose of recording the earth's heat radiation. Our living quarters were set up in a log cabin on the edge of town and all were made as comfortable as possible.

"The first flights were undertaken about four days after arrival at Fort Smith and water take-offs were made from the river and continued uninterruptedly for two weeks. The weather up to this time had been gradually becoming progressively colder and difficulty was being experienced with ice forming on the floats and freezing the controls. About the 15th of October a take-off was made from the river, the ground temperature being about 10 degrees above zero and a climb to 18,000 feet made. On the descent several sharp snags were heard but the cause could not be determined. A cautious landing was made and on inspection after landing it was discovered that practically all former ribs in the floats were fractured or broken. It was then determined that on the takeoff and ascent, ice had formed over the float vents and on the way up air pressure inside the floats had decreased to the pressure at height. On the descent the ice had acted as a valve stopping, air from re-entering the floats. At ground level the outside air pressure had been sufficient to collapse the floats. It was then decided to cease operations on floats and change over to wheels.

"A tractor was procured from the former RCAF base at Fort Fitzgerald and driven the nine miles over the road to Fort Smith. After the aircraft was changed to wheels it was hauled up the 200 foot bank from the river, hauled through town and parked in front of our residence. There was a cleared swamp about a half-mile through the bush from the town that was used by commercial companies for winter operations. As it would be approximately two weeks before the swamp was sufficiently frozen to use as an aerodrome, it was decided to build a hangar on the winter aerodrome to house the aircraft for the winter months.

"A design for the hangar was drawn up and construction started. The hangar was built with doors at both ends to allow the Fairchild aircraft to taxi with wings folded in one door and out the other. A lean-to was also added to provide space for a workshop and room to heat the engine oil. The hangar was completed, the detachment doing all the work of construction, by the time the swamp was frozen sufficiently to support the aircraft. The aircraft was then moved from in front of our quarters to the field, after cutting a road through the bush. Men crossing a slough, the aircraft unfortunately broke through the

ice but it was salvaged before any damage was done, the water being only some four feet deep.

"Flying was resumed on wheels about the first of November and continued throughout the winter.

"A typical flight is now described:

"In the morning, three hours before sunrise, the pilot who was on ground duty would go over to the hangar, start a fire in the stove and put the engine oil to heat. At the same time two blow pots would be started under the tent over the engine and the engine heated up to starting temperature. About one half hour before takeoff time the pilot who was flying that day and the crewman would arrive. Snow would be removed from in front of doors at both ends of the hangar and preparations made to start the engine. The engine tent was removed and the heated oil poured in the tank. Doors were opened and the engine started. The aircraft would be immediately taxied out and the ground duty pilot and crewman would open the wings and lock them in place while the aircraft was on the move. The crewman would then get in the aircraft and an immediate takeoff would be made before the oil cooled below operating temperature. The ground duty pilot would then collect wood and prepare the equipment for the next morning. The two pilots alternated day about on flying and ground duties.

"On the way up to height which was invariably on instruments as flights were made in all kinds of weather, the crewman would take all required visual readings, while the aerometeorograph would record all required data automatically. The height to which the aircraft would climb was limited only by its own ceiling and this in turn was governed, by the amount of ice collected on the wings.

"There were no accurate maps of the country available and the pilot relied on a Lear Radio compass to guide him home. The ROCS at Fort Smith providing the required homing signal. The Lear Radio Compass worked admirably throughout the winter with no maintenance difficulties encountered and always was able to lead aircraft back to base.

"Over 120 consecutive flights were made in the course of the winter with at least one flight and sometimes two per day. Takeoffs were made in all sorts of weather from sunshine to blizzards with visibility and ceiling from unlimited to zero. During the winter temperatures down to 60 degrees below zero were experienced.

"On return to base the hangar doors would be opened, aircraft wings folded and the aircraft taxied inside. As soon as the engine was stopped, the oil would be drained and the doors closed. The oil was then placed by the stove for reheating the next morning. All ice that had accumulated on the wings and

aircraft was then removed by beating with sticks and the aircraft refuelled and prepared for the next flight all maintenance being done at the same time.

“About the middle of February 1937, a change from wheels to skis had to be made as the snow on the winter aerodrome was becoming too deep for wheel operation. The flights were continued without interruption until the end of February when the operation was concluded. All gear was packed and the return flight was made to Winnipeg on skis.”

A/C R.C. Gordon

“My first experience with northern flying was at Cormorant Lake, Manitoba, from May, 1932, until November of that year. During this period, I was the officer commanding the base and the only pilot based there, and had approximately 25 other ranks, under my command engaged in servicing and repairing aircraft.

“The Cormorant Lake base, one of a number of sub-stations under the control of Winnipeg Air Station, was located on the Hudson Bay Railway 52 miles northeast of The Pas, Manitoba. This base was originally constructed as a float-plane and flying boat base for RCAP aircraft carrying out photography and forest fire prevention work in that area. In 1932, the base was used entirely as a servicing point for RCAF photographic and transport aircraft en route to the western Arctic, and as a repair depot for aircraft that could not be accommodated by the facilities existing at Winnipeg.

“The base itself consisted of one hangar with repair shop facilities, slipway, messing and barrack accommodation. The base was self-contained with electric light and fire-fighting equipment, and supplies were brought in from The Pas or purchased in the small town of Cormorant about one mile distant.

“The buildings and anchorage facilities were located in a small bay off Cormorant Lake, which provided an ideal site for the operations for which the base was intended. The terrain surrounding the base is rocky with numerous lakes and a medium stand of timber. The main activity in this area is mining and trapping. The terrain in this section differs very little from the remainder of the land across the northern part of Manitoba, and the industries are primarily the seine with the exception that as one moves farther south, the mining activities increase and lumbering operations are more in evidence.

“The job of commanding this base was very interesting but somewhat lacking in excitement. Very little activity was in evidence at the time owing to a curtailment of expenditures by the Department, and the only flying undertaken was the flight testing of aircraft after overhaul, with the exception of a special

operation carried out that year, known as “Cosmic,” for which was detailed to do the flying.

Operation “Cosmic”

“This operation was conducted to ascertain what effect northern latitudes had on the Cosmic Ray, both on the ground and in the air. The experiments made were under the direction of Dr. Robert A. Milliken of the University of Southern California, who was at that time carrying out an extensive study of the Cosmic Ray.

“To execute this operation, the RCAF supplied a single-engine supercharged Fairchild aircraft, fitted with floats. The operation was to consist of one flight of one hour and fifteen minutes at an altitude of approximately 18,000 feet, to be immediately followed by another hour and fifteen minutes at as high an altitude as could be obtained with the aircraft in question. No oxygen equipment was supplied for the operation and, on contacting the Commanding Officer of Winnipeg Air Station in connection with this matter, a reply was received to “Chew gum and swallow frequently.” To accustom myself to flying at high altitudes without oxygen, practice flights were authorized for approximately ten hours in the air. These flights were of considerable benefit in obtaining information on the area surrounding my base, and flights up to a distance of 200 miles from Cormorant were made at varying altitudes. Shortly after these trial flights were completed, Dr. Milliken arrived at Cormorant with his experimental gear. After some tests were made on the ground in the vicinity of the base, the instruments were installed in the aircraft and there was nothing left to do but wait for suitable weather for the final flight. The equipment was automatically operated and required no one to maintain it in the air with the result that the aircraft carried only myself and an engine mechanic, Leading Aircraftman Fortey.

“The morning after the equipment was installed appeared suitable for the operation and we took off in the Fairchild. At the time of take-off, the weather was clear or scattered clouds and visibility unlimited (CAVU) with a westerly mind, and indications were that it would hold for approximately five hours, which was sufficient time to complete the operation, climbed the aircraft over the base to a height of 18,000 feet indicated and flew on a westerly course of 270 degrees. This course was held for about 45 minutes when clouds began to form underneath and the ground became obscured. The above course at 270 degrees was held until the hour and fifteen minutes had elapsed, and the aircraft was then climbed to an indicated altitude of 23,000 feet and placed on the reciprocal course. After about forty minutes on this course, LAC Fortey became

ill and lay down on the floor. The aircraft was flown on this course for the remainder of the hour and fifteen minutes specified, then throttled back for the descent. By this time, there was a solid overcast underneath at about 10,000 feet and no opportunity had been obtained on the reciprocal course to check landmarks whatsoever. During the last fifteen minutes of this flight at 23,000 feet, I experienced a severe headache which did not disappear until some time the following morning. LAC Fortey was effected in the same way. At about 10,000 feet and just above the overcast, LAC Fortey was able to get up from the floor and enquire how things were going. He was told that the flight had been completed and we were just about to go down through the overcast and return to base. On breaking out of the overcast at about 6,000 feet, an attempt was made to locate our position but without success.

"The terrain was uninhabited and unfamiliar to me; gasoline was running low and, as I was suffering much physical discomfort from the high altitude at which we had been flying, I decided to make a landing to conserve fuel and hoped that by going over the courses flown and the time in the air I might be able to ascertain my approximate position. The conditions under which we were endeavouring to operate were ideal for producing a "flap" and when this develops it is better to "flap" on the ground than in the air, particularly in this type of country. A lake was selected for the landing and just as I was going in on my final approach, a settlement was sighted on an adjoining lake. The aircraft was flown on to the settlement and landed.

"This was Oxford House Post on Oxford Lake. It was a bit of a shock to find myself so far east of my base, but on going over the flight log that evening the answer was a very strong wind of approximately 60 miles per hour at the altitude we had been flying, and as we had been flying above cloud, no opportunity had been obtained to make a check of wind speed during the flight. This meant that our westerly track was reduced and our easterly track on the reciprocal course was extended considerably, which had prevented me from picking up the two landmarks, namely, the Hudson Bay Railway or Lake Winnipeg (which I had relied upon doing when I descended through the overcast) as I had completely overshot these landmarks by many miles. The RCAF had a gasoline cache at Oxford House and the aircraft was refuelled, moored for the night and flown back to Cormorant Lake the following day.

"No radio equipment was carried in the aircraft and consequently no information could be passed as to my whereabouts for the night. On returning to Cormorant Lake, I learned that a search was already underway by aircraft that were on their way back to Winnipeg from the Great Bear Lake district.

“The experimental equipment was turned over to Dr. Milliken intact and still running. It is understood that the data obtained on this flight was included in the research report made by Dr. Milliken on the Cosmic Ray.

Photographic Operations

“During the summer seasons of 1934 and 1935, I commanded an RCAF photographic detachment, and carried out several aerial photographic operations in Western Canada and the North West Territories. A normal photographic operation consisted of an area of 150 miles by 100 miles. The season’s operations were normally planned with two operations in the southern areas of the provinces, for early work in the season, and the following operations were located to the north and in most seasons terminated either on the Arctic Ocean or Great Bear Lake.

“Early photography of this nature was started by the RCAF in 1924 and has continued to some extent every year since. Development work on cameras, camera mountings, photographic techniques and plotting photographs has been great and much has been learned of the country and the problems involved in conducting operations in the remote areas of Canada. The trimetrogon⁶ mounting of cameras in the aircraft of today is a far cry from the scarf-ring mounting for cameras used in flying boats in 1924.

“The main reasons that the RCAF became involved in this apparently commercial type of work [were] that, due to the expensiveness of aerial photography, a very much more limited photographic programme would have been possible, with the funds available, had the work been done by civilian contractor. Also, in the early years, there were very few civilian operators equipped to undertake such a task. In addition, it was excellent training for RCAF crews, not only in photographic techniques but in obtaining a knowledge of this country which has been of great value up to the present, and with the development of long-range aircraft may be of even greater importance in the future. It also made it possible for the RCAF to retain in the service additional personnel and equipment that could not have been retained under the financial limitations imposed on the service at that time, as the cost of these operations by the RCAF was borne by another government department, i.e., [the] Department of the Interior.

“A typical RCAF photographic detachment in 1934-35 consisted of two aircraft, two pilots, two camera operators and aircraft mechanics, and a fifth man who normally remained at the base to assist in servicing the aircraft and

⁶ Trimetrogon is an aerial photographic survey method that employs three cameras in unison to generate stereographic pictures of topography.

cooking for the detachment. At this time the aircraft provided were Bellanca single-engine float planes. The established procedure was for the detachment to commence work in the southern areas as soon as the snow and ice had disappeared and, as the season advanced, move to the more northerly areas. The reverse of this procedure occurred in the fall of the year. No radio facilities were provided in the aircraft, and at remote locations such facilities were not provided at the base. This fact made it essential that each detachment should operate two aircraft to guard against unserviceability and to ensure means of flying out from remote locations, communicate with headquarters and to supply food for the detachment. Communication with headquarters had to be established at least once every two weeks. The above communication arrangement was welcomed by most detachment commanders and it certainly eliminated many of the complications experienced today with a 24-hour service for communication requirements.

“In addition, a detachment normally had a topographical survey representative allotted to it for the season by the Department of Interior. The main work of this individual was to establish control points by astronomical observations throughout the area being photographed to form a basis for the plotting of the photographs taken. For this representative to do his job, the detachment provided aerial transportation to and from these selected control points, assisted in setting up camp and provided food for his requirements. The personnel supplied by topographical surveys for this type of work were rugged individuals. They enjoyed their work, seemed to have a great capacity for living amongst mosquitoes, never ate or slept a great deal and spent most of their time in these remote areas taking observations and exploring the terrain in the vicinity of the location. The two representatives that were associated with the western photographic programme over a great number of years were Mr. John Carroll and Mr. Eric Fry. Both of these men have carried out similar work in other parts of Canada and, as a result, have a very accurate and broad knowledge of the country.

“The detachments were self-contained units. The detachment commander was responsible for establishing bases required for an operation, order and transport food for the detachment personnel, transport gasoline and oil, and personnel and equipment for the detachment. In addition he maintained the accounts for the detachment and submitted numerous reports on each operation. The detachment was equipped with tents, bedding, cooking and servicing equipment for the aircraft and emergency rations in case of forced landings. On operations in the Territories, it was essential that food be ordered in March to ensure that it was available for aerial pick-up at Waterways, Alberta, or Fort Smith, in June.

“Moving the detachment from one place to another became an art in packing and stowing equipment. It was considered that if more than the original flight of the two aircraft was required the efficiency of the detachment was not good, and resulted in queries from staff officers at Headquarters as to why the additional flight was necessary. This, of course, was in keeping with the fine financial limits within which these operations had to be conducted and everyone did try to curtail as much as possible extra flights. This resulted in expert stowing of equipment in aircraft, but when the equipment was on board, the problem of finding room for the crew, and getting the aircraft airborne was something else again. This was usually managed, but under glassy-water conditions and the aircraft loaded to the ceiling: the main requirement was for a pilot with a strong back and two good arms.

“The northern operations that I conducted during the years 1934 and 1935 were located as follows:

God’s Lake, Manitoba.

Area between Great Slave Lake and Lake Athabaska.

Slemon Lake (north of Great Slave Lake to Great Bear Lake.)

Cree Lake (in northern Saskatchewan).

Aklavik, North West Territories.

“The country in the God’s Lake area is rocky, thickly timbered with a heavy underbrush and generously dotted and crossed with lakes and rivers, but for the most part uninhabited, except for the occasional prospector and a few wandering Indians. The country is beautiful from the air, but on the ground [without proper equipment] one can be most uncomfortable as they grow mosquitoes in this country of a large order and in great numbers.

“During the operation I had the misfortune of having a forced landing a considerable distance from base. After making the necessary repairs, it was discovered that insufficient fuel remained in the tanks to return to base. The prospect of being entertained in this country by the mosquitoes was not pleasant and later in the afternoon, with a favourable wind change, an attempt was made to reach base. The effort was not successful and we were again forced to land on a river without fuel and still approximately forty miles from home. The aircraft was beached and we prepared to await the arrival of a search party. The normal procedure followed by the RCAF when operating in this type of country was for the crew to remain with aircraft as it reduced considerably the work of search parties.

“Three days of rain followed which made search operations impossible. During this period, wood was piled for smoke signals should weather conditions improve, and we did some fishing to implement our emergency rations. The diet of ship’s biscuits, supplemented by the fish we caught, was becoming

increasingly unpalatable and we were very pleased to see, on the fourth day, the other aircraft of the detachment circling overhead. The aeroplane landed and after refuelling from their tank we took off for the base at God's Lake, our mosquito bites completely forgotten. This experience did, however, bring to mind a previous flight in 1932, but on which, fortunately, a forced landing was avoided and the dubious pleasures of such an event had not been undergone.

"The operations in the Fort Smith - Fitzgerald area during this period were large. On occasions, two detachments were employed, one working in the southern portion and one in the northern. Most of the area lying between Great Slave Lake and Lake Athabaska was involved with exploratory flights made as far east as the DuBawnt River.

"This country is very sparsely inhabited, the greater percentage of the population being located along the shores of Great Slave Lake, Slave River and Lake Athabaska. The more remote areas, although prospected to some extent, are devoid of population. The terrain varies and large areas of rock, timber, lakes and marshy land are in evidence around Slave Lake and south of Lake Athabaska. Further east, sand dunes appear, many lakes with sandy shores and a small amount of timber. Flying over this area at this particular time, with a 35 mile-to-the-inch map of Canada, with very few accurate topographical features recorded, left a lot to the imagination of the pilot navigator. Under these conditions, the country seemed to be built on a grand scale and very lonesome indeed, and although a pilot may have great confidence in single-engine aircraft, I could never quite forget how long a walk it would be for me and my crewman to get out of the remote areas that this operation covered.

"The actual possibility of just such a situation developing occurred on this operation on one of my exploratory photo flights to the east as far as the DuBawnt River. The flight was approximately 400 miles long and it was anticipated that refuelling on the eastern extremity would be necessary. Indications were that this requirement could be met from a gasoline cache which had been established in the vicinity of the DuBawnt River on Moldaia Lake. All went well until the aircraft reached the indicated location of the gasoline cache. Much to my embarrassment no trace of the cache could be found. The plane was landed and a survey of the gasoline remaining in the tanks was made. We decided that there was a possibility of reaching the settlement at Camsell Portage, located on the north shore of Lake Athabaska, provided a favourable wind prevailed and the glide of the aircraft stretched slightly. Later on in the day, a northeast wind developed and the attempt was made. After approximately two hours flying, Lake Athabaska showed up to the relief of both myself and crewman, but the landing at Camsell Portage was made without any

fuel left in the tanks. I still get a feeling that I would have liked to have found the gasoline cache at Wholdaia Lake.

"There were operational tactics employed by bush pilots flying in the Territories at this time, but to which, on photographic work, it was not always possible to adhere if the job was to be done. Many occasions arose when it became necessary to "stick your neck out" to get on with the job. Looking down at the country and realizing the chances that one would have on foot, these occasions were curtailed as much as possible. The normal practice employed in flying aircraft over this unmapped terrain was to keep on the accepted water routes, carry some extra gasoline (just in case) and to fly "by the seat of your pants." This method seems a far cry from the navigational and-instrument flying aids in the present day aircraft for flying over this country but, with the equipment we had in those days, it paid off.

"During 1934-35, there were several areas photographed between Great Slave Lake and Great Bear Lake. To carry out these operations, aircraft operated from bases at Slemmon Lake, Cameron Bay, Hardesty Lake and Fort Reliance. In addition, small gasoline supplies were flown into several points in the area in order that aircraft might land away from base, refuel and continue with their photographic work without losing good weather time and additional fuel in getting to and from the areas being photographed.

"The area between Great Slave and Great Bear Lakes is rolling with the exception of the western portion where it becomes more rugged with hills reaching in height to approximately 3,000 feet. The soil is of a sandy nature, with a reasonable amount of pine growth, and very little underbrush. Many lakes dot the area with sand and gravel beaches, and the problem of establishing camp anywhere in the area is a comparatively simple operation. The lakes are well-stocked with fish but very little other game is available. Farther to the east, caribou may be found during the summer season. As one flies northeast from the east end of Great Bear Lake, the tree growth diminishes and finally disappears entirely. This is the barren land of the north with nothing but lakes and rolling tundra.

"Through this area, between Great Slave Lake and Great Bear Lake, passes one of the main water routes with its many portages. This route was very popular in earlier years, but with air transportation coming into its own, its use has been reduced considerably. Most of the supplies for the mines at Great Bear Lake are either flown in or taken in by the Bear River which flows into the Mackenzie at Fort Norman. Considerable prospecting has been carried out in this territory and many good finds have been discovered, namely, the Yellowknife area and Great Bear Lake. There is no doubt that many others will be developed when operating expenses can be reduced.

"The trip "down north" from Fort Smith to Aklavik covers a distance of approximately 1,000 miles, and follows the main waterway of the North West Territories—the Slave River, Great Slave Lake and the Mackenzie River. Flying along this route, one passes over settlements established many years ago, such as Providence, Simpson, Wrigley, Norman, Good Hope and Arctic Red River, all of historical interest in the opening up of the Territories. Approximately 50 miles north of Fort Norman is located the Imperial Oil development. This oil field received considerable attention during World War II and much exploratory and development work was undertaken at that time. It is quite possible that in the future this field may again regain importance owing to its strategic location in relation to the Northwest.

"Aklavik is located on the delta at the mouth of the Mackenzie River and is the main centre of trading activity for the western Arctic. The terrain is flat and marshy with a small amount of timber growth. The main activity on the delta is trapping.

"In 1935, this settlement consisted of approximately 50 whites, and was particularly active on the arrival of the first boat of the year from Fort Smith. This occasion heralds the beginning of the summer which lasts a few short weeks, with continuous daylight, before the approach of another long spell of darkness. The arrival of the boat is an occasion for the Eskimos, and they are usually present with their schooners to obtain supplies for their summer's operations.

"Two photographic operations were carried out from Aklavik. One was the Reindeer Reserve north of Aklavik, and the other was a route map running west of MacPherson, across the Richardson and Mackenzie Mountains to the Porcupine River. The weather was perfect and both operations were completed in four days. This constituted a considerable amount of flying in a short period of time which, together with the hospitality of the Aklavik people, left the personnel of the detachment "slightly worn."

"During a transportation flight in the Reindeer Reserve operation to take a topographical survey man to a lake to establish a ground control point, I landed on a lake and, while establishing camp, my crewman discovered an old abandoned cabin a short distance up the shore. This cabin was scarcely more than a hole in the tundra, surmounted by a wooden framework and covered by a badly weathered tarpaulin. Investigation of the interior revealed a human skeleton and portions of an old sporting magazine. No identification was established on the spot or through the RCMP at Aklavik. The discovery merely stressed the grim reality of the frozen northland.

"The trip across the Richardson and Mackenzie mountains west of MacPherson to the Porcupine River was much more interesting than the

monotonous flying over the Reindeer Reserve. This trip followed the Rat River to the summit and then down the Bell River to the Porcupine. This route passes through rugged country with mountain peaks rising to heights of 8,000 feet. Flying up and down the pass the scenery is magnificent. The valley of the Rat River is rocky, but the Bell River valley is wide, particularly as it nears the Porcupine. The Bell River valley appears fertile and the vegetation dense. Several trappers were located along this route and reports indicated that the season's catch was good. This is the area in which the mad trapper, [Albert] Johnston, was eventually located and killed some years previous. From the air, the buildings of LaPere [Lapierre] House [which was the headquarters for the search] were observed. [Lapierre] House was originally built as a trading post but was abandoned some years ago. It was also along this route that an entire detachment of RCMP perished in the middle of winter in 1911 on a trip across the pass from Dawson City to MacPherson.

"My last photographic operation was carried out at Cree Lake, Saskatchewan, in August and September of 1935. Cree Lake is some 150 miles east of Waterways and food supplies had to be flown in from that point. The Cree Lake area boasts considerable activity through the trapping season but late in the summer little habitation is in evidence. A suitable camp site was established in the vicinity of the gasoline cache put in the previous winter, and tents erected for sleeping and cooking. Each non-photographic day witnessed some improvements in camp life, either in sleeping accommodations or in the kitchen. The temperatures continue to go down lower every night at this time of the year, and by the time the detachment left, a solution for keeping warm inside the tents had been produced. This consisted of partially burying a four-gallon gasoline container under the side of the tent, building a smoke stack on the outside with tin cans (our only food containers), and stoking the other end of the drum from inside the tent. The final result bore a "Heath-Robinson" appearance and although the arrangement may not have received the blessing of the Fire Prevention people, it did provide warmth.

"The terrain of this area is rolling with many small and large lakes. The soil is light, with a reasonable stand of timber at this time of the year, the leaves were beginning to turn, which although beautiful and the comforts of camp life beyond improvement, we were all very pleased. when this job was completed and we headed farther south.

Operation "RCMP Post"

"This operation I carried out in 1936 in a Fairchild "71" single-engine floatplane. It was believed to have been the longest single journey ever made by air in Canada at that time.

The trip covered approximately 11,000 miles, starting from Ottawa on 5th July and returning on 3rd August. Of this elapsed time, we only flew on 25 days and the total flying time for the trip was about 125 hours. The passenger carried on the operation was Major General Sir James MacBrien, Commissioner of the Royal Canadian Mounted Police, myself as pilot and Navigator, and Sergeant (Sgt.) Pritchard (now Squadron Leader retired) as engine mechanic.

"This flight was arranged by the RCAF, on a request from the RCMP, in order that Sir James might carry out an inspection tour of RCMP detachments in the Prairie Provinces and the North West Territories. The route followed was: Ottawa - Winnipeg - The Pas - Prince Albert - Edmonton - Great Bear Lake - Coppermine - Cambridge Bay - Great Bear Lake - Aklavik (via the Bear and Mackenzie Rivers) - Richards Island - Fort Yukon - Dawson City - Whitehorse - Lower Post - Simpson - Reliance - Baker Lake - Chesterfield Inlet - Churchill - Norway House - Winnipeg - Ottawa. Many stops for inspection of detachments were made between the various points outlined above, but many of these have been omitted and only the general outline of the route has been covered.

"Most of the flights were interesting, but the ones of particular interest to me were those carried out over territory that I had never seen before, that is, Great Bear Lake to Cambridge Bay, Aklavik to Fort Yukon, Whitehorse and Simpson, and Reliance to Chesterfield Inlet and down to Churchill. On these particular flights, I was still using the 35 mile-to-the-inch map of the Territories plus some strip maps that had been taken in previous years by the RCAF. All prominent landmarks were viewed with considerable interest, and when landmarks did not show up at the time when they were anticipated, much concern was experienced. All these flights were completed on schedule or ahead of schedule and without mishap. Throughout the trip I had the feeling that both Sir James and Sgt. Pritchard were as fully engrossed with the flight as I, and that they were doing the flying as well as myself, although the Fairchild is only equipped with one control column. The problem of refuelling the aircraft in isolated locations required considerable effort in rolling gasoline drums and using the wobble pump. However, these problems were overcome by complete cooperation among passenger, crewman and pilot.

"The flight from Cameron Bay to Coppermine was started late in the evening owing to fog conditions at Coppermine. The route flown was over almost barren, rocky and marshy wastes. Very few accurately mapped landmarks were in evidence until reaching the Coppermine River at Bloody Falls. These falls received their name as a result of the massacre of a group of Eskimo by Indians in the early history of the North. Our arrival at Coppermine was not

any too soon as the fog was just rolling in over the settlement, which resulted in a delayed departure until the following morning.

“Our departure from Coppermine was marked by solid patches of fog on the take off, which became solid a short distance out of Coppermine. This necessitated flying above the fog on a magnetic course for approximately 70 miles before the fog cleared away and we found ourselves over solid ice which had not yet broken up in the Coronation Gulf. This condition was a bit alarming because a floatplane, in the event of a forced landing, is not designed for ice landings. However, we were not confronted with such an exigency and reached Cambridge Bay without mishap. On arrival at that settlement, the RCMP vessel *St. Roch* was riding at anchor in full dress, awaiting Sir James’ inspection. Sufficient open water was available in the Bay for the landing, but I had my doubts as to whether this was sufficient for a takeoff. The landing was made and the inspection completed.

“Our departure from Cambridge Bay was made in the evening with plans for refuelling at Coppermine. The return flight was carried out under ideal weather conditions until we neared Coppermine where the fog had settled down again, making it necessary to continue on to Cameron Bay, on Great Bear Lake. From Cambridge to Coppermine, an excellent opportunity was presented to view the coast of the mainland. Most of the coast is low with gradual sandy or gravel slopes, with occasional outcroppings of rock, rising in some instances to two or three hundred feet. There are some trading posts along this stretch which are only operated at certain periods of the year. In addition, there are occasional Eskimo villages or camping grounds.

“We eventually arrived at Cameron Bay at midnight after a four hour flight. Cameron Bay was like a millpond (not a ripple) and to add additional complications, the high hills surrounding the Bay were reflected in the water. On the power approach for the landing, considerable concentration was necessary to determine which was “up”. The landing was successful and the trip was one of the most interesting experiences of the entire journey.

“During our stay at Aklavik, we visited the reindeer camp east of Aklavik and inspected the herd on Richards Island. There were about 4000 in the herd at that time and the animals appeared to be in excellent condition. A landing was made at the Island and we managed to get in close and obtain some excellent photographs of the herd.

“The trip from Aklavik to Dawson City was made via Old Crow on the Porcupine and Fort Yukon. The trip was started at 5 a.m. and passing over the Richardson and Mackenzie Range along the Rat and Bell Rivers presented a grand view at this time of day. The valley of the Porcupine was easily distinguished at a considerable distance and is wide and fertile. The river itself is

full of sandbars that are continually shifting and landings have to be carried out with discretion. Several trappers' cabins and Indian camps were observed along the river from the Bell River entrance to where the Porcupine empties into the Yukon River at Fort Yukon.

"At Fort Yukon we were given breakfast by Dr. and Mrs. Burke and, after spending two or three hours there, departed for Dawson City. The route from Fort Yukon to Dawson followed the Yukon River. At the confluence of the Yukon and the Porcupine, the country is quite flat and marshy and the growth along the river banks heavy. This type of country continues for several miles then gradually becoming hilly and then mountainous. Dawson City itself is located on the banks of the Yukon River with mountains at its back, while only a short distance upstream the Klondike can be seen emptying into the Yukon. In 1936, Dawson City was very much a ghost town with very little mining activity. However, there were still people there who could show you the piano on which "the Girl who was known as Lou" danced in '98, and also the steam radiator that Dangerous Dan shed his life-blood on before departing from Dawson City.

"Our arrival at Whitehorse was decidedly marked by a very exciting landing below the famous Whitehorse rapids. The current here is approximately 12 knots and landing with the current under slight wind conditions in the narrow channel really caused my feet to dance on the rudder bar. The surface of the water was like velvet and with the eddies that were present, the aircraft seemed to be on dull skates and on many moments during the landing run the wings of the Fairchild came terribly close to the river banks. The takeoff was similar and trying to get a single-engine aircraft turned down stream in such a current presents a problem. The first takeoff attempt was a failure, but the second was successful and the aircraft airborne. I was certainly very pleased to see the last of Whitehorse and to be on my way to Carcross.

"The trip from Carcross to Simpson via Lower Post, Yukon Territory, was undertaken with a certain amount of trepidation, the reason being that I had very little knowledge of the route. The distance involved was approximately 700 miles with only one refuelling possibility, namely, Lower Post. In addition, there was a mountain range at the eastern end before reaching the Mackenzie River at Simpson. However, enthusiasm for seeing new country won out and we flew out of Carcross at 4 a.m., landing at Lower Post at 7 a.m. Once clear of the mountains around Carcross and Teslin Lake, and picking up the headwaters of the Laird River, the navigation problem became quite simple. Flying down the Laird to Lower Post, the country opened up considerably particularly to the south and remained so for some 70 miles east of Lower Post, where the eastern range of the Rockies is again encountered. The Laird Valley around Lower Post

is fertile with a good stand of timber and very little habitation until near the Post.

“The flight from Lower Post to Simpson was not so pleasant. Bad weather was encountered around Hell’s Gate and flying along, the canyon under low clouds caused the air to be very rough and made flying unpleasant. The terrain in and around Hell’s Gate is particularly rugged and continues for some distance east until reaching the Mackenzie River valley, where it becomes flat with very dense timber growth and underbrush. Shortly after reaching the Mackenzie valley, still following the Laird River, a severe rain and snow storm was encountered. Rather than fly through this storm, a landing was made on the Laird, and after the storm had passed we flew on into Simpson.

“The country east of Fort Reliance to Chesterfield Inlet and down the coast to Fort Churchill is practically all barren wastes, with the exception of the area to the north of Reliance through the [Thelon] Game Reserve. The route followed was northeast from Reliance to Clinton-Golden Lake, then east to the [Thelon] River, down the [Thelon] River to Beverley and Baker Lakes, then on to Chesterfield, and down the coast to Churchill. Once the [Thelon] River was reached, the navigation problem was much easier, and I was using a strip map made a few years previous which continued on through to Chesterfield, but once one got off the strip map, navigation became very confusing due to the great number of lakes and other water routes not mapped, and lying just off the strip map that I was using. It was along this route that the Hornby expedition perished in 1926.

“While crossing a section of a game reserve about 30 miles east of Beverley Lake a herd of musk-ox was observed. We flew low over this herd and managed to take some good photographs, which illustrated the defensive formation these animals adopt when they have decided to make a stand.

“Our departure from Chesterfield Inlet was made as the fog off the Bay was commencing to roll in over the settlement, which is quite customary at this time of year. The first part of our flight south was over the top of the fog which continued for some distance south. After breaking out into the clear, navigation consisted of merely following the coastline. A number of Eskimo villages were spotted along the coast, which was free of ice for some distance into the bay, and many white whales were observed in the bays along the coast and in the harbour at Churchill. Our landing at Churchill was made very exciting by their presence, as they kept surfacing in the landing area which was very disconcerting. However, they were particularly adept at keeping out of the way and no casualties [occurred].

Group Captain (G/C) C.L. Trecarten

"This officer's sub-Arctic experience includes primarily the Photographic and Geodetic Survey Mission in 1934 which included areas around Lake Nipigon in Ontario and, as the winter retreated into the north, so did the Photographic Detachment, as commended, follow it to Great Bear Lake where a considerable amount of oblique photography was done using Bellanca aircraft equipped with three aerial cameras which could be used for taking simultaneous oblique photographs or one vertical photograph, depending on the terrain and the nature of the information required. From the base of Great Bear Lake (Cameron Bay) a large area was photographed between Great Bear Lake and the Yellowknife River, also photographic survey using vertical photographs of the shores of Great Bear Lake and a tie-in between Great Bear Lake and the Mackenzie River with the idea in mind of finding a suitable route for a road between Great Bear Lake and Mackenzie River which could bypass the rapids in the Great Bear River which constituted a great hazard in getting water borne supplies into the important Eldorado Mine. After finishing this operation, the Detachment was ordered into the Rocky Mountains between the North West Territories and the Yukon Territory to do a photographic job in the area around the head waters of the South Nahanni River.



Figure 2-11: Nahanni River

“To understand the reason for carrying out this operation, a slight deviation from the story is necessary. Some years ago, in 1903 to be exact, two brothers by the name of McLeod, who lived at Fort Liard, were found murdered on the South Nahanni River in the vicinity of Dead Man’s Valley. The circumstances surrounding their death were rather mysterious in that the whereabouts of a so-called English Mining Engineer, who was known to have been with them, could not be ascertained. After many years of searching, he was located in Vancouver after having deposited a considerable sum of placer gold with one of the banks there. However, he was never apprehended and it is thought, when he discovered that his whereabouts were known, he went back into the Nahanni country. This fact combined with the knowledge of the value of placer gold deposited by him immediately started a legend woven around the so-called lost placer gold mine of the McLeod Brothers. Many half hearted attempts had been made to discover this mine and about 1932 considerable interest was revived in that area as certain prospectors had been in there and returned with samples of gold and the story of the possibility of great wealth there. This, of course, resulted in the rush of prospectors to that area to stake claims, most of these claims being staked in the wintertime as the prospectors were flown in by air and in many cases the claim stakers did not return over the difficult terrain to work their claims. The revival of interest in the South Nahanni immediately brought to light certain so-called mysterious disappearances of prospectors and trappers in that area and the finding of the odd person who had died a mysterious death. The name “Headless Valley” appears to have been given to this area about this time apparently because the odd person who was found dead there did not possess a head. It is a known fact that certain individuals disappeared in that country and RCMP records will show that certain individuals, the number, of course, being very few, were found actually minus their head. It is the writer’s candid opinion that these things can be explained very simply. The disappearance of the odd individual, I think, can be explained by the fact that there are certain hot spring areas in there from which apparently had sprung the old legend of the Lost Tropical Valley. The warm water from these springs made the ice very unsafe and travellers blundering onto these unsuspected unsafe areas were swept away under the ice and drowned. The explanation for these bodies found without their heads, I think, can be explained by the fact that the area abounds in grizzly bears and this animal is known to be very hard to kill and entirely unpredictable in its actions. Therefore, it is conceivable that, if a prospector or trapper encountered one of these animals and did not succeed in killing it, the grizzly bear would be capable of lifting his head off with one swipe of his paw and very likely carry it off so

that the head and the body could not be found in the same locality. Many words have been written in magazines and in the daily press on these legends of the Headless Valley; some of them are founded on fact and others are pure fiction. However, the whole, when viewed by an impartial observer who knows the country and appreciates the difficulties of operation there, makes interesting reading and still is considered by many people to be a mysterious part of Canada which could bear looking into more carefully. Although no great wealth in placer gold has been discovered there, certain evidence of the existence of such is prevalent, the officer himself having panned gold on non-photographic days and actually obtained a fair gold showing. However, in all fairness to that part of the world, it must be understood that the remoteness of the area would very likely preclude economical mining operations unless fabulously rich deposits were discovered. The geology of that part of Canada does not seem to lend any hope that such deposits would be discovered.

"The type of operation done by G/C Trecarten in the RCAF in that area consisted of vertical photographs to be used in the making of proper maps and oblique photographs taken along the South Nahanni, the Flat and the Caribou Rivers to tie in with previous photographs taken by the RCAF along the Liard. River to Nahanni Butte where the South Nahanni flows into the Liard. Mr.



Figure 2-12: Nahanni River

Eric Fry of the Lands and Mines Department of the Dominion Government was with this Detachment and he busied himself with establishing bench marks at strategic places in the area so that the exact longitude and latitude of the area could be determined. The whole photographic operation was conducted not with the help of more or less accurate maps previously prepared but with the assistance of what might be termed a sketch map containing information procured from Indians, trappers and the odd Government party who had made short overland traverses in some of the more easterly areas. It is interesting to note that, although the horizontal scale and the direction of many of the rivers were slightly in error, it was still fairly easy to fly by this sketch map as the relative turns and positions of small streams flowing into the rivers were remarkably accurate. This speaks well for the overland traveller who could only estimate the distances travelled and rely upon his memory to put the river bends and important tributary streams in their proper positions. The weather during the period the operation was fairly good and Mr. Fry was able to take enough star observations to definitely establish his Geodetic points and to allow the aerial work to progress satisfactorily. Unfortunately, the weather turned bad about the 26th August and snow in the mountains forced a hurried retirement as food supplies were running low and prospects of being frozen in for the winter were not looked forward to. Subsequent plotting of the photographs enabled [the] Topographical Survey Branch to produce a reasonable map of that part of the world and will allow proper plotting of any mineral claims which may be subsequently recorded in that area.

G/C V.H. Patriarche

“This officer flew about 350 hours of survey search and inspection flying over the staging route in the Yukon and Mackenzie areas. Most of his own bush and sub-arctic work was done as a commercial pilot from 1929 to 1939. He tells hereunder the story of the NAME Coppermine Expedition, which for its time was one of the most extensive and best organized, and one which aided the development of subsequently important territory.

NAME COPPERMINE EXPEDITION, 1930

“The NAME (Northern Aerial Minerals Exploration Co., Ltd.) was an aerial prospecting company formed about 1927 by Jas. A. Richardson with Jack Hammell as president, H.A. (Doc) Oaks as manager of the Aerial division, and the late Gordon Duncan as manager of the mining branch. It operated throughout most of northern Canada until 1932 and put the first aircraft into many northern and arctic points where regular services have since been

developed by the commercial transport companies. With very few exceptions, the pilots and engineers were ex-members of the RCAF, or the RAF and its predecessors the RFC and REAS. It had its main base at Sioux Lookout, Ontario.

"The Coppermine expedition of 1930 really began in 1929. In the fall of that year, T.M. (Pat) Reid and the late J.D. Vance, with a Fokker Super-Universal and a Fairchild FC.2W2, moved a party of prospectors from one of the company's advanced bases at Baker Lake NWT across the barrens to Fort Hearne at the mouth of the Coppermine River. This was the same route on which the MacAlpine party, from Dominion Explorers Ltd., became lost a few weeks later and precipitated what is probably still the most extensive aerial search and rescue operation ever to take place in the Canadian north.

"Reid and Vance landed three prospectors (Scotty Gaul, Glen Rapson and Bill Storr) at Fort Hearne, and left them to winter there with the object of tracing-down Samuel Hearne's old reports of the fabulous Copper mines from which the Copper Eskimos obtained the material in its native form. The two aircraft then returned to Sioux Lookout; and not long afterward joined in the MacAlpine search which lasted most of the winter.

"In the late winter 1929-30, the major operation of the Coppermine expedition began with the departure of five aircraft equipped with skis from the Sioux Lookout base. These were two FC.2W2s and three FC-2s flown by H.A. Oakes, W.J. McDonough, and A.M. Berry, the late F.B. Baragar and V.H. Patriarche. They carried their entire mechanical crew, running and base spares, and equipment for isolated operations to last until the end of the open water season. In addition they had on board a part of the mining party.

"From Sioux Lookout the party flew to The Pas, Man. via Goldmines; Oaks, McDonough and Patriarche reaching the Pas on the second day, while Berry and Baragar were delayed by mechanical trouble and bad weather on Lake Winnipeg, and followed later. Owing to bad drifting of the snow at The Pas it was decided to make the first freighting base at Cranberry Portage, fifty miles north, from which additional supplies were picked up and staged to the old Domex camp at Stoney Harbour on the N.E. shore of Lake Athabaska. As no word had yet been received from the two machines that had been delayed, Oaks and McDonough with the larger aircraft began moving supplies over the long haul up to Stoney Harbour, while Patriarche based there, and freighted ahead to the next base at Fort Fitzgerald on the Slave River.

"When Berry and Baragar rejoined the party at Cranberry, the second piece of bad luck occurred. Berry in taking off with a heavy load from badly drifted snow broke a ski pedestal, the aircraft dropped on one wing, and among other things broke the main spar.

"The rest of the party continued with the job of staging through to Fitzgerald while Berry and his mechanic, assisted by a party rushed up from Sioux Lookout, took on the job of rebuilding the damaged aircraft out on the ice.

"The job was accomplished under very difficult conditions, and Berry was able to come up with the main party at the Slave River base some two weeks later.

"Here, the expedition was to be augmented by picking up additional men and equipment from Fort McMurray, the end of steel 250 miles to the south, and this was done at the same time as freighting was commenced from Fitzgerald to Fort Rae, a further 300 miles north where the next base was to be established; and by the first week in April all supplies and the entire party had been established at Rae. As the winter by this time was nearly over in the south, two of the smaller aircraft flown by Oaks and McDonough made a run for it and got back to Sioux Lookout on the tail end of the ice, while Berry, Baragar, and Patriarche remained to constitute the Arctic party.

"Freighting out of Rae was hampered by extremely heavy drifting, and the available runway was a patch of slightly smoother snow sheltered by some willow scrub, and about two hundred yards long. To help matters it lay east and west, while the prevailing winds were northerly. However, it was possible to lose most of one's speed on it before hitting the drifts when landing, and to get up thirty or forty miles an hour before being bounced into the air on the drifts when getting off. Baragar's original machine had already been damaged by these conditions but was fit enough for Oaks to fly out light, while Baragar took over the remaining undamaged F.C.2.

"The first prospecting party was to work out of Fort Rae, and Baragar made a temporary base there from which he established them in the bush to the north while Berry and Patriarche with the two larger machines began the next stage of the move to Great Bear Lake. The Great Bear Lake party was landed in a bay just on the Arctic Circle on the east side of the lake, and made camp to be ready for field work as soon as the land cleared in the spring. The heaviest drifting of the entire operation was encountered on Bear Lake, with concrete hard drifts about four feet high being common; and it was necessary to land in sheltered spots at all times.

"The final stage of the journey to the main arctic base then began, with Berry and Patriarche moving the first parties out of Rae, to be followed later by Baragar. The first attempt to get through to the coast was turned back due to heavy snow beyond Dismal Lakes in the barrens, and the party returned to the north east arm of Bear Lake, where a cache had been established, to refuel. On the second attempt, the blizzard was still bad on the lower Coppermine River

and Berry who was leading, decided to land and await better weather after passing Bloody Falls. He was successful, but in following him down a few minutes later Patriarche struck the river bank which was difficult to see in the snow, and put the undercarriage through the side of the cockpit and broke the port wing. As it was late in the day, and the exact location of the landing was uncertain the party made camp and remained the night.

“The next morning Tom Creighton, the chief prospector (one of the discoverers of the Flin Flon mine) who had been in to Hearne with Reid the year before, climbed a hill and found that they were only four miles from the post, so the party boarded the remaining aircraft and taxied in to the settlement. With the help of the three men who had wintered there, some natives and forty-two dogs the damaged aircraft was hauled off the river bank and towed into the settlement to await repairs. A few days later Baragar rejoined the party, and the three crews with the two remaining aircraft began the task of putting out the Arctic field crews, laying caches, and mapping the geology from the air as soon as the spring thaw was sufficiently advanced.

“Early in May, Baragar took the big machine south to Fort Resolution on the last ice, where she was to change over to floats, while Berry and Patriarche remained with the small aircraft and continued to operate off the seas ice until the first week of June.

“When the aircraft had been beached to await the break-up, Patriarche, accompanied by the chief mechanic Humble, set up a camp near Bloody Falls (ten miles up the Coppermine) and, using home-made instruments, ran a water-power survey of the falls to fill in the mapping originally begun by Douglas some years before, and to ascertain the possibility of developing hydro-electric power at this point on the river. Flow measurements were taken some five miles below the rapids, sketching and rough levels were run of the potential headwater area above the falls, and within the limitations of the equipment available, mapping and levels were run in some detail along the actual gorge. The resultant maps and calculations were subsequently made available to Ottawa.

“In early July Baragar returned with the large Fairchild on Floats, and summer operations began on an intensive basis. By August two Chalcocite and one Bornite finds had been made, the last being of considerable size and running nearly 50% Copper. The Hudson’s Bay Company supply vessel Bay Chimo arrived in mid-August bringing floats for the two beached aircraft, and a new wing for the crashed machine whose fuselage had in the meantime been repaired by a welder flown in from Fort McMurray. Both machines were rigged on pontoons and undertook the next phase of the operations which consisted of carrying field work eastward along the coast as far as Bathurst Inlet. Very rough seas were encountered, as the season was getting late and winds were high, but

considerable exploration and sketching was carried out. Here, at Bathurst post, the last accident of the season occurred when, in starting up on a very cold morning, Berry's engine kicked over backwards and knocked the starter off the back of the crank-case. As there were no communications available nearer than Baker Lake, it was necessary to make temporary repairs, so the starter aperture was blanked off with a metal plate, the cracks in the crank-case plugged with rags soaked in marine glue, and the engine started by hand-swinging for the remainder of the operation.

"By the latter part of August, the weather was becoming cold and unreliable, and it was decided to move all parties out in early September. The move south was carried out by the three aircraft, picking up the other field parties on the way. Further exploration was done in the Bear Lake, Athabaska, and Reindeer Lake areas which were at that time little known geologically, and the party finally reached Sioux Lookout at the end of the month.

"The operation was interesting from the flying point of view in the fact that for six months in winter and summer conditions the aircraft remained self-supporting, and working nearly two thousand route-miles from the main base. Three incidents of major damage were repaired in the field, and considerable new geological information, sketching, and hydrographic information was obtained. It was probably the most extensive of the early aerial prospecting ventures, and marked the beginning of the developments in the area north of Edmonton in which the Athabaska, the Yellowknife, and the Great Bear mining regions have since become an important part of Canada's mineral economy, while the Copper discoveries near the Arctic coast hold promise for the future when transportation developments bring them within economical range."

Figure 2-13: Vickers Varuna



Chapter 3

EARLY ARCTIC OPERATIONS

Introduction

The prewar activities of the RCAF in the true Arctic were of a very limited nature. The two main operations were a reconnaissance of aviation possibilities carried out by Squadron Leader (S/L) R.A. Logan in 1922 and the Hudson Strait Expedition, whose object was to gather information of navigation conditions in the Hudson Strait and was composed mainly of RCAF personnel. Both these are treated in detail below.

The first experience of an RCAF officer in the Arctic was that of S/L R.A. Logan, who was sent out by the Dominion Government to report on the possibilities of aviation in the Arctic Archipelago. He accompanied the Canadian Government Arctic Patrol in the C.G.S. *Beothic* in 1922. The following information was gleaned from S/L Logan's original report.

He begins with certain generalities about aviation in Northern Canada and the following remarks are of interest as they can apply as well today as they did in 1922.

"Much has been said of the possibility of future hordes of Slavs overrunning Europe and the great use of aircraft which would be certain in such an event. Aircraft operated from Arctic or Sub-Arctic bases which would swoop down and leave trails of destruction throughout the rest of the world, but from the very nature of their bases of operation they would be almost [inaccessible] for aircraft of countries to which "Cold Weather" flying was unfamiliar, and it is generally agreed that the best method of defence from aircraft is to destroy the enemy's aircraft before it leaves its own borders. Whether war with such a country as Russia would ever come or not should not affect the determination to develop flying in the Canadian Arctic and Sub-Arctic regions because Canada, if it considers itself worthy to be called a Nation, should have enough pride and spirit to take at least ordinary precautions and be prepared to defend herself in any emergency. Canada proved during the Great War that her men in the Royal Air Force were equal to any in the world, and it now remains for her to show the rest of the world that she can defend herself, and the whole British Empire if necessary, from all comers from the cold countries in the North of Asia - or Europe - by having men trained and proper material and information available through actual practice within her own boundaries."

S/L Logan continues with his report as follows:

The Northern Archipelago

“The Northern Archipelago comprises all of the Arctic Islands lying to the North of the mainland of the American continent, with one combined area of some 600,000 square miles, equal in area to 1/5 of the remainder of the Dominion of Canada, and forms part of the British possessions in North America which were transferred to the Dominion by Order-in-Council of the Imperial Government on the 1st September, 1880, and in 1903-4, 1906-7, 1908-9 and 1910-11, the Canadian Government despatched expeditions to winter in the northern waters of Hudson’s Bay [*sic*] in the Arctic Archipelago to take formal possession by raising the British and Canadian flags and by depositing copies of the proclamation in cairns erected at various points. During the summer of 1922, an expedition was sent north on the Canadian Government Steamer “Arctic” to establish Mounted Police Posts and thereby confirm possession and occupation of several of the islands in the eastern frontier of the Archipelago. This expedition, in addition to establishing the Mounted Police Posts, carried a representative of the Canadian Air Board for the purpose of investigating the conditions affecting the operations of aircraft in the Arctic regions. That representative was S/L R.A. Logan.

“The Northern Archipelago consists of a large number of islands which have, for convenience, been divided into four natural groups as follows:

Group No. 1 - The islands situated in the northern parts of the Hudson Bay and Hudson Strait. The chief islands in this group are Southampton, Mansfield, Nottingham, Salisbury, Charles, Coats and Akpatok, while many of the smaller islands are still unnamed on the chart.

Group No. 2 - Includes the islands lying between Hudson Bay and Hudson Strait on the south and Lancaster Sound on the north, the western boundary of the group being Prince Regent Inlet and the Gulf of Boothia. There are two large islands in this group. Baffin and Bylot, while the remainder are generally small and are fairly close to these two large islands.

Group No. 3 - This group includes the islands lying west of Prince Regent Inlet and south of Lancaster Sound, Barron’s Strait and Melville Sound. These islands are almost [*inaccessible*] by ship from the east as they lie to the west and south of the usually ice covered waters of Lancaster Sound - the only channel by which they may be reached from the eastward. The western islands of the group can be reached by passing through the Arctic Ocean from Bering [*sic*] Strait along the east, or by descending the MacKenzie [*sic*]

and Coppermine Rivers. They comprise the islands of Banks, Victoria, Prince of Wales, North Somerset and King William.

Group No. 4 - This group consists of the islands north of Lancaster Sound and Melville Sound. The chief islands are Ellesmere and North Devon, Cornwallis, Bathurst, Melville, Prince Patrick, Axel, Heiberg, Ellef, Ringnes, King Christian and North Cornwall.

“During the summer of 1922, parts of only two groups were visited, namely the north end of Baffin Land and Bylot Island in the second group.

“The eastern coast of Baffin Island is generally high and rocky, and has never been accurately surveyed and charted. The land rises quickly from the sea, often in precipitous cliffs to an elevation of 1,000 feet or more, after which the upward slope is more gentle as the land rises towards the interior table-land. The general elevation of the table-land to the north of Cumberland Gulf ranges to 1,500 to 5,000 feet, with occasional hills rising above that, perhaps one to two thousand feet higher. Inland to the south of Pond’s Inlet the general elevation of the mountainous part does not appear to exceed 2,000 feet, and to the westward along Fox Channel it is considerably lower.

The chief reasons for lack of exploration of the interior of the country is that the Eskimos have great aversion to travelling anywhere excepting on the ice along the sea coast. They may make short excursions across portages to fresh water lakes; or during the summer they may make trips thirty or forty miles inland in search of caribou, but only in cases of necessity, and therefore, especially in the winter time will seldom travel far from their source of supply. Even when short journeys have been made into the interior of the country by white men, it has always been done in the season of the year when the ground was covered with snow in order that they could utilize dogs for transportation of their clothing and supplies. This does not, of course, include short distances such as five or ten miles inland on the small valleys near the coast.

“It would appear that in the summer time practically all of the small bays and low land near the coast have considerable areas of their ground, at least partly- covered with vegetation, but the extent of this ground free from snow can only be determined by photographs from the air during the summer season of the year. The interior of the country at some places may consist of mountain ranges or high table land covered with snow, but there is no reason to believe that the whole of the interior is of this nature, in fact there are many indications that the interior of the country may be much more free of snow than in generally supposed. The western interior of the northern half of Baffin Island is described by the Eskimos as a rough plain, probably less than 1,000 feet in elevation, diversified by rolling hills with numerous lakes in the valleys between.



“Bylot Island lies to the north east of Baffin Island, being separated from the latter by Pond’s and Navy Board Inlets, and Eclipse Sound. It is roughly circular in outline, with a diameter of nearly 90 miles. In physical character it closely resembles the north eastern part of Baffin. The general elevation of the interior ranges from 2,000 to 3,000 ft and the coastal highlands are covered with an ice cap which extends 10 or 15 miles inland, although the interior, according to the Eskimos is free from snow during the summer.

western part of the island is formed of limestone and is a flat table-land cut by deep narrow fiords that extend inland many miles from the coast. The general elevation of the table-land in the eastern part is nearly two thousand feet, but this decreases in the west so that on the west side the cliffs are below one thousand feet. There is lower land along the western side of the island where there is a good growth of Arctic plants on which large numbers of musk-oxen feed, together with some barren ground caribou and Arctic hares. Walrus and white bears are also plentiful among the ice of Wellington Channel, which separates North Devon from the islands lying to the west. It is unpopulated, although indications have been found in several cases of ancient Eskimo habitation. It is probable that Eskimos from Baffin Land cross Lancaster Sound to hunt on North Devon Island, but it is not believed to be regular practice for them to do so. There are several extensive plains of land which are free of snow close to the sea coast. This also may be said of several islands which are along the eastern coast.

“A large area of the north eastern part of North Devon Island was observed from an altitude of about 3,000 feet on the ice-cap of Ellesmere Island southeast of Plan Fiord, in the latter part of August 1922, and as far as could be seen to the south the interior consisted of slightly rolling table-land covered with perpetual snow, broken by several gorges a mile wide which ran southerly for probably 10 or 15 miles. Towards the west, however, the land appeared to become gradually lower and there appeared to be a large area free of snow. The distance from the point of observation was from 30 to 60 miles, but with exceptionally clear [visibility].

“Ellesmere is only second in size to Baffin Island and is remarkable for its north end extending to beyond the 83rd parallel of northern latitude, or to within 500 miles of the North Pole. Its length from north to south covers nearly 7 degrees of latitude, or approximately 500 miles. Its greatest breadth across the northern part extends 200 miles. Its outline on the west side is quite irregular, being indented by large bays. The island is separated from Northern Greenland by Smith Sound and Kennedy and Robisson¹ Channels. The general elevation of the eastern half of the island is high, probably exceeding 2,500 feet. In the northern part the United States mountains are upwards of 4,000 feet high, with isolated peaks probably reaching to 5,000 feet. It has been remarked by several explorers that, contrary to their expectations, the northern part of Ellesmere Island is not covered with a continuous ice-cap but instead there are extensive plains or table-lands comparatively free from snow, especially in the summer. These plains, like the extensive plains on the western side of the island, are

¹ *Editor's note:* Robeson Strait.

covered with Arctic vegetation, and musk-oxen, barren ground caribou, foxes and Arctic hares are found there in large numbers, along with geese, ducks and other [aquatic] birds. This island has been crossed from east to west about the central part, and has been explored on the west by the Norwegian explorer Sverdrup.

“Only the southeastern part of this island was observed this season, and as far as could be ascertained the southeastern quarter of the island is covered with perpetual snow excepting the more prominent headlands and the larger valleys, although many indications were found of ancient Eskimo habitation, and several forms of caribou were found, indicating that these small areas of bare ground not absolutely isolated by the ice-cap from the feeding grounds of these animals, and that though [uninhabited] now, were at one time quite thickly settled with Eskimos.

“There are widespread indications of coal in nearly all of the islands inside the Arctic circle. Considerable coal has been mined for local use at Pond’s Inlet. Coal was found by Commander Nares at Lady Franklin Bay on Ellesmere Island in a seam two hundred and fifty yards long and twenty-five feet thick. He reported the coal to appear to be an excellent fuel, containing less than three per cent of water. No doubt coal can be found in many other places if searched for, and although the general impression seems to be that this is coal of very poor quality, the explorers in their reports do not seem to bear this out but indicate rather that the coal is of sufficiently good quality in many places to be used for all ordinary purposes.

“Oil shale has been noted in several places and analysis of specimens obtained by Captain Bernier in 1910 from Bathurst Island shows 140 gallons of oil per ton of shale. This might indicate the possibility of obtaining oil in this country, but at least sufficient to be used locally for aircraft and motor transport purposes.

“During this season a peculiar sand was found on the shore of Dundas Harbour, of which a sample was brought back, and this has been described as being similar to the famous ruby sand of Nome, and is a probable indication of gold. This has not yet been analyzed. It is considered advisable that this district be investigated by properly trained men in the near future. There are indications of copper at several places, although not many were noticed this season. A peculiar discoloration of a rocky hillside was noted near the south easterly point of Ellesmere Island. This discoloured rock was of a bright green colour and appeared to be stained from water running out of a crevice in the hillside. This was noticeable for a mile from the hill and may or may not be an indication of copper.

“The eastern side of Baffin Land, North Devon and Ellesmere Islands consist of very high table-land, in both cases covered with perpetual ice and snow. The prevailing easterly winds blow over the open water in Davis Strait and become [laden] with moisture, which is condensed upon reaching the cold mountains and form clouds of snow, so that by the time the air has reached 50 miles inland most of the vapour has been condensed and consequently there is less snow and fewer clouds that mould appear from a view of the first few miles from the shore.

“In addition to there being a lighter snow-fall in the interior, the general appearance of the country is that the land is lower as one goes west, and includes many fairly low plains covered with vegetation supporting herds of musk-oxen and caribou.

“Owing to the comparatively light snow-fall and the drifting caused by the winds, it is probable that many of these plains become clear of snow quite early in the spring, and it is also quite probable that the surface air, at least, becomes quite warm if not hot, during the summer months when the sun is shining for 24 hours a day, though when there is no night to cool the ground the sunlight, even if it is not powerful, is continual, and radiation from the ground must warm the air to a great extent to produce much Arctic vegetation. One thing in favour of this theory is that herds of caribou and musk-oxen appear to find plenty of food in the interior during the winter, while during the summer they very frequently feed over the smaller scattered plains or bare ground near the coast. By means of aerial photography the extent of the plains or ground free of snow could ascertained, and by transporting geologists and prospectors and persons interested in the musk-oxen and caribou industry much of the hitherto natural resources of the island would be discovered.

Aircraft Uses

Some of the uses suggested by S/L Logan are omitted as they do not apply today, but many of his suggestions have already been used, or could be used presently. He begins by saying that there are many uses for aircraft in the Arctic Archipelago in assisting the exploration and investigation of the extent of the natural resources of the territory and its continuity. Topographical and geological surveyors may be transported to otherwise [inaccessible] places, to many other places where their season of operation may be greatly extended by the reduction of time required for travel.

“The extent of grazing ground capable of supporting animal life, such as musk-oxen, caribou or reindeer, may be found, as well as the number and location of existing herds and breeding grounds of these animals.

“In many ways the Arctic is an ideal country for “Lighter than Air” craft—airships.

“The sunlight is practically constant during a long season of the year, and this is one of the greatest factors in the operation of any type of airship owing to the effect of sunlight and the expansion and contraction of the gas in the balloon. It is also a great assistance in navigation.

“One great advantage of airship over aeroplane is that an airship is self-supporting independent of the engine, whereas the aeroplane depends on the engine for power - it is forced to come down as soon as the engine stops or loses its minimum speed. An airship can remain in the air for much longer period than an aeroplane on the same power, and can carry a fairly heavy load, but some of the disadvantages of airships are the bulky buildings required to house them and the number of men required to handle them in making landings, unless mooring masts are used. Owing to its faults an airship is greatly affected by high winds, especially when near the ground, but it is possible that in such northern latitudes the high winds may be only a comparatively low altitude, an airship might be able by ascending a few thousand feet to ride out what would be a fairly strong gale on the surface.

“During the summer of 1922, several peculiar wind conditions were observed which would seem to indicate that the strong winds so often referred to by Arctic explorers are in many cases very local in character and do not reach very high altitudes. Winds 30 to 40 miles per hour were experienced at the entrance of Pond’s Inlet for several days in succession, while during the same period 15 miles inland there was dead calm.

“When regular navigation is established through the Hudson Strait it will be necessary to have one or more detachments to watch the ice and report positions to the ships. This may be done by wireless and photography. Regular ice patrols will become necessary as an aid to navigation through this Strait. Photographs of the ice and open water for miles ahead of the ship may be taken, developed, printed and dropped on the ship in the vicinity every day.

“Ships will not have to waste time trying to get in to harbours which are not clear of ice, and advantage will be taken to call at open ports first, while through traffic will be able to follow the open water, and once the relation between weather conditions, tide and general ice’ movements is determined, in forecasts compiled by utilizing aircraft and wireless, navigation through the Hudson Strait will lose much of its hardship and danger.

“In connection with the ice-patrol, wireless ice condition reports will be broadcasted, for any extensive navigation they will soon be considered as necessary as the wireless weather reports are today in the more southern parts of the continent where they are sent out every few hours.

The only practical way of observing on the daily movement of ice over large areas is by the aid of aircraft and aerial photography.

“Meteorological reports should be sent south by wireless every few hours to aid in weather forecasting in the more inhabited parts of the world, and while this may not require the actual use of aircraft, it will require the use of the wireless stations operated in conjunction with aircraft.

Ice Conditions

“As far as could be ascertained from observations during the short season spent on the expedition of 1922, and from verbal and written reports of men who have spent many years in the Northern Archipelago, there should be several months during the summer when it is certain that aeroplanes could be operated, and the indications are that it is probable that operations could be carried on successfully for several additional months.

“All of the waters within a few miles of the shore on the east side, and practically all of the inland waters of the Archipelago, are frozen solid during at least seven months of the year, and in the bays and small inlets the ice forms about the end of September and remains until about the 1st August, as a rule, although some bays may be cleared by the action of wind and tide earlier than this, and some places may not clear at all if the weather during the summer is fairly calm.

“The ice forms each winter to a depth of probably eight feet in many places, and is rotted to a certain extent during the summer by the action of the sun and is finally broken by the action of tides and wind and washed out of the straits and channels by the currents which flow towards the south and east.

“In a season when there is much wind and heavy seas from the east the ice is broken in the larger channels about the middle of June, or possibly earlier, and the smaller bays and straits clear about the end of July.

The end of the season for regular ice travel along the shore is about the middle of July, and ice travel commences again about the middle of October.

“Then the seas is fairly calm in the spring and summer the ice takes much longer to break up and drift clear, because the wind has a great effect on the drift of the ice, as well as has the tide and currents.

“The tide at both Pond’s Inlet and Craig Harbour is about nine feet between ordinary high and low water. Large pans of ice drift into shallow or rocky waters at high tide, and when the tide goes out are left high on the rocks, and consequently are broken by their own weight into smaller pieces. This nearly always happens to the edge of the ice near to the shore.

“When the ice first moves it is in large pieces, sometimes several miles in length or breadth, but it gradually breaks up into smaller pieces. The larger

pieces in many cases would make excellent landing places for aeroplanes if it were desired to land upon them. As far as could be observed this year the ice was still strong and smooth enough for this up to the 8th September in several places, but especially at Salmon River.

"In the sheltered bays where the ice had not cleared by that date, the new ice would prevent any further weakening of the old ice, so it would appear that many places in ordinary years will be available for suitable landing places.

"The snow on the ice-cap of North Devon and Ellesmere Island would make excellent landing ground, at least in the summer. The condition of this snow was investigated on the Ellesmere ice-cap at an altitude of about three thousand feet above sea level. The surface was swept smooth by the wind and covered with a fairly heavy crust in most places, but on some hillsides the snow would not support a person walking, but in no case did one sink below the ankles. This would be quite satisfactory for landing aeroplanes equipped with skis. The surface of this ice-cap is slightly rolling, with wide expanses of level or almost level areas.

"The top surface of the larger glaciers in the valley, while being in general appearances fairly level in places, are actually of a much rougher surface than the snow fields of the table-lands owing to the cracks and crevices caused by the seaward movement of the glaciers.

"Several glaciers were observed which would serve as emergency landing grounds, and probably many more would be discovered, but in practically every case where the glacier does not reach to the water's edge there is a wide strip of level gravel beach between the foot of the glacier and the end of the bay. This gravel is sometimes covered with vegetation, but in many cases will probably be found to be bare. These beaches will serve as the best landing grounds for aircraft equipped with wheels.

"The surface of the sea-ice will also be visible so long as the sunlight is strong enough to cast a shadow. There are many places where ridges of broken ice are formed by the winds and tide breaking up the edges of the ice on large areas of partly open water before the whole surface is frozen over. This results sometimes in ridges, several miles in length, of broken ice cakes piled many feet high, making landing of aircraft impossible. These ridges or rough areas can be avoided under ordinary circumstances, for, while it is necessary to have smooth ice to land on, the actual area required is not so very large, and when the sun is shining strong enough to cast a shadow it will be fairly easy to pick out the areas of smooth ice from the ridges or rough ice. One of the great difficulties travelling by dog train in this country is that when such ridges of rough ice are met they have to be crossed over, and sometimes it takes many hours to travel one mile. All this could be avoided in travelling by aircraft.

“It was noticed that the surface of the ice late in the season consisted of long narrow pools of fresh water or slush, with ridges of dry, hard ice between them. The hard ice is white, while the soft slush or water is dark colour. The hard white strips are generally several hundred yards in length and ten to fifty yards in width. These alternate strips of dry white ice lie parallel to the direction of the prevailing winds. Actual practice will soon give the necessary experience to enable the pilot to judge the exact surface conditions of the snow and ice underneath him, but as a general rule small pans or small areas should be avoided when there is a choice, for the larger the field the more likelihood of it being free of rough ice.

Climatic Conditions

“Large areas of open water tend to keep a more constant temperature than would be found were there nothing but ground, snow or ice, as the water prevents extremes of temperature, and in the northern part of Baffin Land, at least, the temperature seldom goes as low as it does in some of the southern districts of Canada, such as northern Ontario, Manitoba and northern Alberta, where thousands of people are living carrying out farming operations.

“In the winter there are from all accounts many high winds which blow much of the snow from the level plains and when the sun begins shining in the spring the remainder of the snow soon melts and the bare ground acts as a reservoir of heat received from the sun.

“The sun at Pond’s Inlet is not visible from about the 9th of November to the 3rd February. During this time the only light is the stars or the moon, and travelling at any time there is no moonlight is very difficult and dangerous owing to the darkness. For several weeks after the sun set of November, and the same period before it rises, the sky is partly lighted at noon similar to the ordinary dawn, but the bright stars are visible throughout the whole 24 hours. The period of total darkness when there is practically no light whatever from the sun is approximately 2 months, and during this time it is like continual midnight in the more settled parts of Canada.

“The moonlight is said to be much stronger than in southern latitudes, but this is partly due to the reflection from the ice and snow, and partly because the eyes are not accustomed to the bright rays from the sun.

“When the sun is first visible it is seen only for a few minutes at noon, but the length of this period increases steadily as the sun seems to get higher in the sky each day until it appears to travel around the whole horizon without setting. It does not get very high at noon, but the lowest it gets is at midnight. It continues to revolve in a spiral, gradually approaching the zenith and getting farther away from the horizon until about June 21st it begins to gradually spiral

back to the horizon until it finally touches it at midnight, and then continuing in its southerly spiral the periods when it is visible become shorter each day until it is seen only a few minutes at noon for a few days and then sinks out of sight about the 9th of November.

“During the period of continuous daylight flying could be carried on for the full twenty-four hours as far as visibility would be concerned, and for a large part of the year the darkness is not sufficient to prevent flying, at least several hours per day, although it is probable that there may be several months when the temperature will be too low to permit flying, but whether flying can be carried on in temperatures much below zero on the ground remains to be determined only by actual experience.

“Apparently the coldest season of the year is in February and March, especially after the sun has commenced to shine. The weather during the winter of 1921-22 and the following summer, according to the reports of the white men who were living at Salmon River and Pond’s Inlet, was not very severe, and there were no gales or strong winds, and from May to the time the C.G.S. [*Arctic*] departed, September 8th, there were practically no windy days and the sun was shining most of the time.

“There was and always is wind close to the open sea, especially when the country near the sea is covered with ice and snow. This is caused by the difference in temperature between the air over the open water and that over the ice and snow.

“Salmon River, being twenty miles or more inland from the open sea, although it is on the edge of a channel or sound, has an entirely different climate from that of the eastern coast of the land, even twenty miles away. The Sound remained frozen until September in 1922, and Salmon River was beyond the range of the local sea breezes and in addition has immediately to the south, at least one hundred square miles of bare, rolling plains to radiate the heat received from the sun’s rays, with the result that the sky in that vicinity was fairly clear of clouds all summer.

“It would appear that flying would be possible from probably the 1st May to the end of September, although this is perhaps a shorter season than may be found by actual experience. In Baffin Land there are many lakes in the interior, the ice on which could serve as landing places, or later on in the season the surface of the water could be utilized for flying seaplanes, although this season would be very short.

“The fogs noticed in the summer of 1922 were all very low and were very local. The prevailing type of cloud was cirrus, but very thin and forming very little obstruction to the rays of the sun. Layers of strato-nimbus clouds were observed a few times near the coast at an altitude of about two to three

thousand feet, and were seldom over one thousand feet thick. The visibility at all times was good except for one very noticeable peculiarity - fog clouds formed by the air from the open sea striking the cold hills. Low fog is frequent at certain times of the year along the outer edge of the stationary ice.

"When even a slight breeze was blowing off the water a fog cloud would be formed for perhaps one-half mile in breadth all along the seaward edge of the hills or table-lands at various heights, but generally about fifteen hundred to twenty-five hundred feet above the sea level. The density and extent of this fog bank depended on the temperature and strength of the wind. With certain changes the fog settled low, but seldom was very thick vertically. When the sun is shining in the valleys or farther inland, snow may be falling from the fog clouds along the high ground near the sea. This fog cloud is very local and the position of the clouds in relation to the open water would give a very good indication of the direction of the wind.

Navigation, Wireless and Photography

"The compass is a very unreliable instrument in the northern Archipelago because many of the islands lie to the north of the north magnetic pole, and it is probable that in many cases the compass needle will point straight south. During the summer of 1922 the greatest variation noticed was about 110 degrees so that the compass there was pointing approximately southwest. By using a gyroscope compass much of the difficulty of direction finding will be overcome.

"It is recommended that one method which might be employed on the preliminary survey of the sea-coast and bare ground in the interior would be to determine the geographical position of prominent objects 20 to 30 miles apart by astronomical observations, and have the intervening country located by aerial photography, and if wide-angle oblique aerial photography are taken at right angles to the line of flight a great deal of territory could thus be explored.

"It is often possible to gain much time by taking advantage of the knowledge of the mind at various heights, as a round trip journey between two points may sometimes be made with a favourable wind in both directions by flying at two different heights. Each base will require to be equipped with recording instruments such as an anemometer, which is an instrument for recording the velocity and direction of the surface winds, a barograph for automatically recording the pressure, and a thermograph for recording the temperature. These instruments can be operated by Air Force personnel without necessity of a meteorological officer being specially employed on the station. When a proper network of wireless stations is connected up with the outside world, regular

weather reports and ice reports will be sent south or to the ships for purposes in aiding in the forecasting of weather conditions.

"A wireless receiving set was carried during the summer of 1922 and daily time signals and world news bulletins were received throughout all parts of the voyage. The receiving apparatus consisted of a simple tuning circuit using one vacuum tube detector with no additional amplification, and the aerial used was fan type and made of insulated bell wire, the span at the top being 25 feet and the height about 25 feet. With this, laid signals were received from stations in Europe and in the United States, and when the ship's aerial was used still louder signals were received. The climatic conditions appeared to be very favourable for the reception of wireless signals and the mountainous country seemed to have very little effect on these incoming signals. It is probable that during the winter-time the atmospheric conditions would be even better and it is believed that throughout this whole territory wireless telephony could be carried out over much greater ranges than farther south.

"One of the chief uses for aircraft will be in connection with aerial photography, for by means of photography wide areas of the country can be explored at leisure and all the records are kept for future reference. Then a country is explored without the aid of photography, ninety per cent of it is overlooked because the 'eye cannot permanently record what it sees, and especially in a cold country it is not convenient always for the explorer to write down everything that he sees, and other new views tend to obliterate much from his memory. But with a camera, once the photograph is taken it may be enlarged and the details searched out at leisure. Large areas will be covered and will be of the greatest importance in connection with the making of maps and charts, especially if used in conjunction with astronomical observations taken at prominent points along the surface of the island.

Fuel, Food and Clothing

"One of the most important questions at any station in the north will be the supply of fuel, but it is believed that by a proper choice of location and by a proper investigation of the fuel supply of the country it will be possible to find plenty of local coal. It is well known that there is a large supply of coal available at Salmon River, Pond's Inlet, although it is believed that this coal area, or a certain part of it has been leased or granted to the Arctic Gold Exploration Company. There are many other places where coal seams have been noted and it is probable that many more coal fields can be found, so that if a local coal supply can be found available one of the greatest difficulties of work in the north will be overcome. Coal could be mined during the winter and freighted out sometime during the year, probably by utilizing motor transport.

“There is a type of heather or moss which grows wherever there is bare ground, and has very good burning qualities. This is used to a great extent by the Eskimos as they burn it by itself and also use it as a wick for their seal-oil lamps. It is believed that this can be pressed into bricks while damp and would make a very good hot fire when dried, although it would probably burn up very quickly.

“For any extensive aircraft operation a large amount of gasoline and lubrication oil will be required and it would be a great advantage to have some source of local supply.

“Indications of such a supply have been found on Bathurst Island, where [analysis] shows oil shales yielding 140 gallons of oil to one ton of shale, this might sometime be developed and in time would supply all the fuel required for aircraft and motor transport in the north even if no better oil producing areas were discovered. It is recommended that oil stoves be used for cooking purposes unless there is a plentiful local supply of coal. Gasoline lamps are not recommended owing to the danger of fire through careless handling, not so much of the lamp as of the gasoline.

“Where sufficient fuel is available it would be much more convenient in every way to have a local electric lighting plant installed, which would be suitable for the illumination of all of the buildings on the station, and by using a small steam plant and utilizing local coal it might be possible to keep this running all the time required, for, while it will be required almost 24 hours a day for perhaps four or five months of the year, the remainder of the year it will not be required at all.

“The food supplies should include much vegetable matter and substances containing much fat and sugar. Very little salt pork should be used. Concentrated foods will be required to be carried on all journeys in the machines. Throughout the greater part of the year it will be necessary to melt snow or ice for water, but during the summer season there are many streams of fresh water as well as many pools of fresh water on the surface of the ice.

“It should be possible to obtain supplies of fresh meat of various kinds, such as caribou, bear and seal. It will also be possible to get large supplies of salmon if attention is paid to procure them during the proper season, and quantities of them could either be salted down, dried or frozen. Frozen fish could be stored in local icehouses or, if transported and stored near the perpetual ice, there should be no difficulty in keeping them in good condition indefinitely. It is probable that other kinds of fish could be obtained at various parts of the islands.

It will be found necessary to carry extra stores of food, clothing and various small articles, such as tools, ornaments, etc., for the purpose of trade with the

Eskimos. Any purchases, or payment for any work performed by the Eskimos, would be paid with this material, as at the present time ordinary currency is of no value for trading purposes.

Clothing

“The clothing worn by all aircraft personnel should be as much as possible similar in every way to that worn by the natives of the islands, with such [improvements] as may be found advisable. The best material for all clothing is either caribou skin or seal [skin] tanned with the fur on, and while woollen clothes are satisfactory to a certain extent, it is generally agreed that skin clothing is better. For at least the outer garments it is much to be preferred.

“The usual clothing worn in the North, by the Natives at least, consists of two [suits] of fur garments, the inner one worn with the fur inside and the outer one worn with the fur outside. The foot covering universally worn is made of seal skin sewn in such a manner that the boots, or kamiks as they are called, are absolutely waterproof. They reach almost to the knees and are made large enough permit several pairs of socks being worn. These socks are generally made of seal skin with the fur inside. If woollen socks are worn care must be taken that the socks are not all the same size; the outer ones must be a larger size than the inner, otherwise there will be a tendency to cramp the foot and stop circulation, and cold feet will be the result. The seal skin boots are absolutely necessary and are worn by all persons at all times. The sewing on them is very carefully done and all repairs to the boots are made by the Eskimo women. It will therefore be necessary to employ at least one Eskimo woman at each base for the purpose of looking after the repairs of boots and other skin garments. The soles of these kamiks are made from the large bearded seal locally known as the oogjook, and will stand a great deal of rough wear on the ice, but of course will not stand very much travelling over bare ground. Knee-length rubber boots should be supplied and it would be advisable to take a sufficient number of ordinary heavy boots for Rear when travelling in the interior or working around the coal mines. They should be large enough to permit a sufficient number of heavy socks being worn. During the wintertime it will be necessary to wear kamiks all the time.

“The outer jacket is generally made of caribou skin, although it is also made of seal skin. This is a large pullover coat with hood which may be pulled up over the head, the edges of which should protrude several inches in front of the face. This projecting part of the hood acts as a protection from the extreme cold air during the winter as it acts as a dead air space, and the cold air directly in front is partly warmed by the breath.

“The leather or skin garments have the valuable property of keeping the wind from penetrating and are therefore much warmer than any garments of wool. Garments worn in the open air during the wintertime should not be brought into a warm room but should be taken off outside and have the snow shaken off and left in the cold air but away from the reach of the dogs. It will be found that when garments are brought into a warm room the fine particles of snow in the fur soon melt and make the garment damp and they are then frozen stiff when taken, into the cold air again. The mitts worn should be roomy and of two pieces. The inner mitts should be of wool and separate from the outer covering of smoked, tanned leather. Each person should be supplied with at least two sets of all garments, especially mittens and socks, tend care should be taken that garments worn during the day are taken off and dried in the evening. Clean dry garments are essential for warmth.

Eskimos

“It will be necessary for the personnel of an air station in the North to learn the language of the natives of the country - the Eskimos. The country is not very thickly inhabited but the various tribes of Eskimos scattered throughout the country speak practically the same language. It is true that there are various local dialects, but these are only slight changes made in the general language which is spoken from Greenland to Alaska. There are quite a few Eskimos who speak a little English, but it is generally very poor English, just as the so-called “Eskimo” that a few white men speak is really very poor Eskimo. The Eskimo language itself is really a wonderful language, with innumerable forms and rules of grammar, etc., but it is not always used properly by many of the more ignorant natives.

“It will be found advisable to employ Eskimos for work around the air station-in various ways, but especially in connection with hunting for food and clothing. When employing an Eskimo it is always necessary to include his wife and family, because one Eskimo man alone is of very little use. An Eskimo and his wife always work together, and to engage an Eskimo without his wife would mean that he would have no one to look after his clothes, and consequently it would be impossible to get very much work out of him. The Eskimos do not require very much pay, but what they want most of all is a little food and clothing, but the greatest care must be taken for square dealing between Air Force personnel and all Eskimos.

“It will be found advisable to carry an Eskimo in at least one of the two aeroplanes on every long trip. This Eskimo will assist as a guide, but his chief duties will be to look after the welfare of the party when on the ground or ice as an Eskimo will find game where a white man would starve to death, and he can



Figure 3-1: Photo of Inuit children.
Source: DHH
Logan fonds file 24

find his way over the country where a white man would probably be lost or would become frozen to death. If no Eskimos are living at the place where it is decided to make an aircraft base, it is highly recommended that several families be induced to settle there.

Craig Harbour

“It was originally intended to establish a Mounted Police Post at Fram Fiord on the southeastern part of Ellesmere Island, but when the neighbourhood of the entrance of the Fiord was reached it was found that for several miles in all directions from the entrance there were extensive fields of unbroken ice, and after waiting several days in hopes that this ice would be broken up sufficient to permit the passage of the ship, it was decided to make no farther delays in attempting to enter the Fiord, but to find some other place which would serve as a temporary location for the Police Post.

“For various reasons the location chosen was a small shallow harbour northeast of Smith Island, and the supplies for the Mounted Police were landed and buildings erected at approximately latitude 76° 12' north, and 61 west longitude. The harbour or bay ran about a mile and a half to two miles inland with an average width of about two miles. At the end of the bay there is a valley

left by retreating glaciers, composed of gravel and rocks with patches here and there of Arctic vegetation, such as moss, small shrubs and various kinds of small grass and flowers. There are fairly steep cliffs on both sides of the harbour and valley. The bay appears to be an inlet running into a table-land which has a fairly level top at an altitude of about two thousand feet. There is perpetual snow on the top of this table-land, although it is not very deep in places and many rocks show up, especially near the top of the cliffs. The widest part is not over two miles wide. It gradually rises towards the north and runs back about a mile and a half from the water's edge, where it terminates in a glacier. This glacier does not appear to be moving either forward or backward, although it is probable that there is a gradual movement downward, but this is counter-balanced by the amount which it melts each year.

"Twenty rock rings of [ancient] Eskimo habitations were discovered on the western side of the valley and a considerable number, but not counted, were found on the eastern side on a small grassy bench fairly close to the shore. The Mounted Police buildings were erected close to the water's edge on the western side of the valley, but the best place for an emergency landing ground for an aeroplane would be on the eastern side, although it is probable that an aeroplane could be landed almost anywhere on the gravel beach along the front of the valley. A rough survey was made of the most favourable looking terrace and it was found to be roughly six hundred yards in length and about two hundred yards wide, with fairly smooth surface. It is not, however, recommended to be used as anything other than an emergency landing ground as all conditions there are unfavourable for the operation of aircraft.

"The harbour is too shallow to permit ships to come nearer than one and a half or two miles from the valley, and all cargo would have to be transported in small launches, and even this is very difficult owing to the numerous boulders in the shallow waters of the bay, and owing to the drift of the tide and currents in that vicinity the bay is nearly always partly filled with floating cakes of ice, and with winds blowing the ice into the bay navigation becomes not only difficult but dangerous. The landing ground in this valley being so low beneath the surrounding walls of the valley, it would probably be difficult for an aeroplane to get out owing to the probable downward currents of air in nearly all positions of the wind. The harbour apparently breaks up quite early and the ice would be rough because of the shallow water and the range of tides. The tide measured at this harbour showed a range of about nine and a half feet between high and low water, and at each low tide large cakes of ice were stranded high and dry on the rocks. This would be certain to create a very rough surface on the ice in the winter, and would therefore be almost impossible for use for landing aircraft. It would be possible to land almost anywhere on the snow-capped tablelands or on

the top of the glaciers, but it would be rather difficult climbing up and down to the buildings in the valley.

It is recommended that no attempt be made to establish an aircraft station at Craig Harbour, but that investigations be carried on farther west as there is every reason to believe that the conditions in some of the fiords farther west would be very favourable for aircraft operation. It was noted during the season that there were extensive areas of open water far to the west of Fram Fiord and valleys of bare ground were seen all along the coast as far as could be seen from an altitude of about three thousand feet slightly southeast of the entrance of Fram Fiord. One of the reasons for choosing Craig Harbour as a landing place for the ship this season was that as it is at the entrance of Jones Sound it would be fairly accessible each season. Supplies could be landed there and later moved to points farther west if required. It is recommended, therefore, that if any aircraft work is to be carried on in the southern part of Ellesmere Island this harbour be disregarded entirely and that steps be taken to locate a more favourable base farther west, or at least find a place where supplies could be landed and taken in over the ice to some bay or inlet as far as possible from the open waters of the sound.

"It is believed that the farther the air station is from the open water the better, and therefore it would be preferable to have it placed as far inland as possible in a fiord which may not necessarily be accessible by ships, for it would probably be found that a ship can unload a cargo onto the ice of the inlet or at some point from which the supplies may be reshipped. One of the reasons for choosing Fram Fiord is that the reports from Captain Otto Sverdrup, who discovered it and explored it in 1899, indicate that there was a great deal of vegetation there and many indications of game, although he observed none during his short stay in that vicinity. According to his reports there was a large area of bare ground in the vicinity of the fiord, and this would probably indicate the possibility of suitable location for an aircraft base, although if it were possible to proceed regularly each year as far west as Musk-ox Fiord on the southwestern part of Ellesmere Island, it is probable that a much more favourable location could be found where there would be more bare ground and more possibilities for game.

"All reports would indicate that there are many more winds and gales in Smith Sound than in any other part of the islands, and if an aircraft station were placed on Ellesmere Island somewhere in the vicinity of Cape Sabine, much greater difficulty would be found in connection with flying than at points farther south. It would appear that the valley or break between the mountainous country of Greenland and Ellesmere Island acts as a natural channel for winds blowing from the Polar Sea towards Baffin Bay, or vice versa. The prevailing



Figure 3-2: DND photo 13080

winds appear to blow down the channel from north to south. The natural route of aircraft from Cape Sabine to the other islands of the Archipelago would be to cross Ellesmere Island to the western coast and then proceed southerly along the low ground on the east side of Norwegian Bay. It is probable that if a base for aircraft were required somewhere in the vicinity of Smith Sound this would have to be established well inland in one of the numerous fiords west of Buchanan Bay, and would probably not be accessible by ship.

Dundas Harbour

“The second harbour visited was Dundas Harbour on North Devon Island, approximately north latitude $74^{\circ} 32'$, Longitude $82^{\circ} 32'$ west. This appears to be a very good harbour, well sheltered from the open waters of Lancaster Sound and apparently one of the first harbours of the North to become clear of ice. There are several rocks near the entrance of the harbour, but once inside in the inner basin there is a well sheltered harbour large enough to accommodate many very large ships. The water appears to be fairly deep right up to the edge of the land on the eastern side and there are good facilities for erecting buildings and using this harbour as a distributing centre where large ships from the south could discharge their cargoes, which could later be reshipped by smaller ships to the various parts of the islands. The best place for landing supplies would be on the eastern side inside the harbour about one-half mile or a little more, but the area of level ground would probably not be suitable for an aircraft landing ground, although it is possible that an aeroplane might make a landing there if certain areas were cleared of loose boulders.

“The most likely place for an aeroplane landing ground would be at the head of the inlet about two miles north from the entrance of the harbour. The ground here was not actually investigated at a closer range than a mile, but it appeared to consist of a valley about a mile wide and a mile or two deep, with a fairly level plain of gravel or soil free of snow, and there were many indications of vegetation and musk-ox and caribou. The sides of this inlet and valley were probably not over one thousand feet high and appeared to be of horizontal bands of alternately hard and soft rock much cut by the action of wind and water. There appeared to be much bare ground on the valley and hillsides towards the north and west, and the northwesterly end of the various branches of the valley could not be seen.

“It is probable that this would make a fairly favourable base in many ways, but it remains to be seen whether a point so close to such a large body of water as Lancaster Sound would be sufficiently free of fog and winds to permit the extensive use of aircraft throughout all ordinary seasons of the year.

“A peculiar formation of rock was noted near the western entrance of this harbour, and a sand beach was noted near it which seemed to resemble the ruby sands from which gold is mined on the beach at Nome, Alaska. This sand is very heavy and appears to contain myriads of small particles of either ruby or garnet, as well as some kind of iron particles, and it is possible that further investigation might be profitably carried out.

“It is quite probable that the most favourable place as far as central location is concerned would be somewhere at the western end of Lancaster Sound, probably at Cornwallis Island or Melville Island. It is certain that if all conditions were favourable for an aircraft base to be established somewhere in the vicinity of Cornwallis Island, this would be very central for operations throughout the whole of the Northern Archipelago, and it is believed that a ship would have more chances of reaching a harbour on the western end of Lancaster Sound than it would have of reaching many of the harbours on other parts of the islands, as it is believed that Lancaster Sound is one of the first channels to become broken up in the spring.

“It is quite probable that a fairly good location could be found in Admiralty Inlet in North Baffin Land, but the most suitable place which was investigated during this season was in the neighbourhood of Salmon River in Eclipse Sound, or more commonly known as Pond’s Inlet, between Bylot Island and Baffin Land.

Pond’s Inlet

“The Hudson’s Bay Company’s most northerly Post was established in the summer of 1921 on a small point about one and a half miles east of the mouth

of Salmon River on the south shore of Eclipse Sound. This point is about fifteen miles from the entrance of Pond's Inlet. Pond's Inlet is really the part of the channel which lies east of the narrowest point between Bylot Island and the north end of Baffin Land. This narrowest part of the channel is about three miles in width, and westerly from this point the channel widens out to an average width of about fifteen miles, but with many deep bays or inlets running southerly from it, very few of which have been accurately charted.

"The settlement formerly known as Pond's Inlet is about ten miles east of the Hudson[s] Bay Company's Post and consists merely of a few Eskimo habitations and a few small houses and store-houses owned and occupied by the Arctic Gold Exploration Company. This settlement is at the extreme easterly edge of a large area of bare ground and lies at the westerly side of a high range of hills or mountains covered with perpetual snow, which appear to run in a southerly direction far down the eastern side of the island. This area of bare ground appears to extend westerly for probably sixty miles or more and southerly for at least ten miles, where there are a certain number of hills, but it is possible that to the south of these hills there may be considerable more bare ground which is free from snow in the summertime. The bare ground consists of rolling plains varying in height from one hundred to one thousand feet, and is dotted with small ponds and lakes and cut by numerous ravines and many large streams of running water during the season when the snow is melting, the largest of these streams being Salmon River.

"Salmon River is a small stream about fifty feet wide, flowing northerly and emptying into the southeastern part of Eclipse Sound. The adjacent country consists of a series of hills and plateaus which rise from a few feet to one hundred feet along the coast and reach a height of five or six hundred feet, six or seven miles inland. These hills consist of yellow and red stone covered in many places with a whitish clay of a few feet thickness. Plains and hills dotted with numerous lakes and ponds, and cut by numerous ravines, gullies and small streams, extend east and west along the coast from the mouth of the river and inland probably eight or ten miles. In the summertime the plains and low hills are covered with moss, turf, coarse grass, stunted herbage and heather. In the months of June, July and August innumerable bright coloured flowers, green, white, red, yellow, purple and mauve, besprinkle and liven the landscape. The birds arrive in June and include many species.

"The river has been traced inland for about twenty miles and is fed by numerous side streams, and has its origin near a large glacier almost due south of Pond's Inlet village. The bed of the river consists of a series of rapids and falls, filled with boulders and gravel banks. There are several lakes connected with this river and lying about eight or ten miles inland, although there are large

numbers of small lakes at various points all over the plain, from which smaller streams, run down to the river. To the south of this plain there are mountains but there appear to be several gaps in them and it is probable that the bare ground runs much farther inland than the presence of these mountains would indicate. There is much coal-float in the river and about four miles from the mouth coal is mined by the Arctic Gold Exploration Company for local use at the trading post. The spring salmon run from the lake to the sea from June 15th to July 5th. They apparently become very fat during the summer, and during the month of August they ascend the river to spawn. The fish are reported to ascend and descend the river in greatest numbers when the moon is full. The salmon are reported to be very fat in the fall and run from twenty to thirty inches in length and vary in weight from three to twenty pounds.

“There appears to be a fairly abundant vegetation of Arctic mosses, grasses and heather, etc., and apparently the plains to the south and west would support large numbers of caribou or musk-ox, but no musk-ox have been killed here for many years and the caribou seem to have been killed off and are very seldom found now without proceeding twenty or thirty miles inland from the seacoast. This place has been inhabited by Eskimos for a great many years and it is probable that since the use of firearms, especially rifles, has become common with the Eskimos the local herds of caribou have been killed off or driven farther inland.

“The bare ground, and the distance that this plain lies from the open waters of Baffin Bay, apparently have a beneficial effect as far as the local weather is concerned, because it was observed, during the past year at least, that, even while fog banks could be noted at the Narrows and at Pond’s Inlet settlement, it was very seldom that there was any stormy weather in the vicinity of the Hudson’s Bay Trading Post at Salmon River. The Hudson’s Bay Company’s buildings were erected in the summer of 1921 and the Royal Canadian Mounted Police buildings were erected in 1922 only a few hundred yards east of the former. Apparently one reason that this location was chosen by the Hudson’s Bay Company was that although there is lower ground near the mouth of the river, the best location was granted by the Government to Captain Joseph-Elzéar Bernier and transferred by him to the Arctic Gold Exploration Company, and any sites which might have been favourable for building purposes were bordered by such shallow water that it was impossible to get a ship nearer than half a mile from shore. As it is, the ships cannot get nearer than a quarter mile from the Hudson’s Bay Company’s buildings.

“The buildings have been placed on a strip of land about half a mile long and about one hundred yards wide, and averaging about ten feet above sea level along the front, gradually sloping back to the foot of a steep hill or rather

sloping moss-covered bank which rises abruptly about two hundred feet to the edge of the slightly rolling table-land. At each end of this strip of fairly level ground there is a creek bed about ten feet wide, down which streams of fresh water rush during the summer season, but which of course are frozen very early in the autumn, but from which a plentiful supply of water or fresh water ice could be obtained throughout the year.

“There is a small area of comparatively level ground about one-quarter mile back of the Hudson’s Bay Company’s buildings, which could be used as a landing ground for aeroplanes during the season of the year when it would be free from snow, but it would require a little work done to it in removing loose boulders before it could be used for landing in all directions. Time was not available for this to be accurately surveyed, but a rough, topographical survey was made of it, shown on the accompanying sketch, and a number of rocks were painted white in such a manner that they would appear to be parts of an equilateral triangle, with the sides about [thirty] yards in length. The length of runway on this level area would be probably three hundred yards in most directions, with very good approaches.

“While the best location for an air station observed during the season of 1922 was at Salmon River, it is almost certain that better locations in the vicinity of Eclipse Sound can be found with more investigation. Some of the disadvantages of the Salmon River locality would be the melting of the ice in the summer, caused by the warmer fresh water from the river, and because the station would be located on the side of the Sound where there is a strong current caused by the tides. If the station were located on a sheltered bay or inlet in deep water, it is probable that the ice would remain much longer in the summer than it would on the open edge of the Sound where there are tidal currents. It is probable that suitable locations could be found either in Oliver or Arctic Sounds or Milne Inlet, or farther west in Admiralty Sound.

“There are at least three places at present to which such investigating officers should be sent: Pond’s Inlet, South Ellesmere Island and Lake Harbour, on the south coast of Baffin Land. The officer detailed for duty at the latter Post should investigate the neighbourhood of other Trading Posts along the south coast of Baffin Land as far as possible. The examination of this district is important in connection with the air stations required in connection with the co-operation of aircraft with marine navigation through the Hudson Strait - which may perhaps not be required for a few years but which is certain to be developed in the near future.

“As soon as a Police Post is established anywhere in the islands west of Lancaster Sound an experienced Air Force officer should be detailed there to investigate flying and relative conditions in that neighbourhood.

“Although more territory could be covered in one year by several Air Force officers being sent to various places without being [equipped] with aeroplanes, it would be much better if they were able to carry on investigations which would be greatly aided or extended by the use of aircraft, although much information of scientific interest would be gained without their use.

“It might be noted in this connection [that] the best system for placing tide gages would be to have small snow huts or igloos built on the ice in some inlet where it is reasonably certain that there will be no sideways movement of the ice during the winter season. A hole would be drilled through the ice in the centre of the igloo and a tube or pipe filled with coal-oil would be left in this hole, and the tide gage would be installed in such a manner that a line running down through the pipe to a mall anchor on the bed of the sea would record the rise and fall of the ice as it is moved up or down by the tide. It is probable that favourable locations could be found for this in a great many places where the ice would remain firm from the middle of October to the middle of June, or possibly even later in the summer season.

“It also might be noted that the most favourable locality for tide readings would be in some inlet where there is as little tidal current as possible and where the ice might remain throughout the greater part of the year. This also is the most favourable locality for the location of an ice aerodrome, and in this respect a locality suitable for an ice aerodrome would also be very suitable for taking tide readings, and on an experimental station it would at least be possible to determine one or two favourable localities for the readings, and also the best methods to employ in keeping the instruments at a temperature sufficiently warm to ensure their steady operation.

“Owing to the great relation between the meteorological conditions in the Arctic and the ensuing weather in the United States and Canada, it will be a matter of only a few years before both countries will demand daily information by wireless of what the meteorological conditions are, and once a start is made in the direction for such a proposed experimental station, other Departments will demand an extension of this service in supplying information.

“Much experimental work would also be carried out in aerial photography if photographs were taken every day upon which a machine was flown, as it is considered that owing to the peculiar light conditions and glare of ice and snow it may be found necessary to make some slight changes in methods or materials in order to obtain the best results. There is a greater contrast between ice and land than is usually found in aerial photographs taken in southern latitudes, and owing to the sameness of the surface of the ground and the absence of trees it will require a clear-cut negative to show the type of surface, whether, grass, moss or barren.

“It will be imperative for the air operations personnel to be able to communicate with the natives of the country in which they may be working, and during one years sojourn amongst the Eskimos a sufficient knowledge should be gained to be of great assistance to those members of the Air Force or other Government Departments who come after.

“It is hoped that it may be seen fit to establish an experimental station at Pond’s Inlet during the season of 1923, for even if it were twenty years before an urgent demand arose for extensive operations in the Arctic Archipelago, the information gained on such an experimental station as suggested would be of the highest value in determining the proper organization and equipment to be used, and in acquainting a certain number of officers and men with the conditions to be expected and some of the difficulties to be overcome on a smaller scale, whereas if there were a sudden emergency requiring aircraft to be operated on a fairly large scale, such as certainly would arise in the event of a big mineral or oil strike, and there had been no such preliminary investigation of actual flying conditions, much time and money would in all probability be lost in trying to carry on service operations under practically unknown conditions, but the value of this information is not confined merely with the operation of aircraft, but will be of great value to everyone connected with the future exploration, survey or development of the Northern or Arctic regions of Canada.”

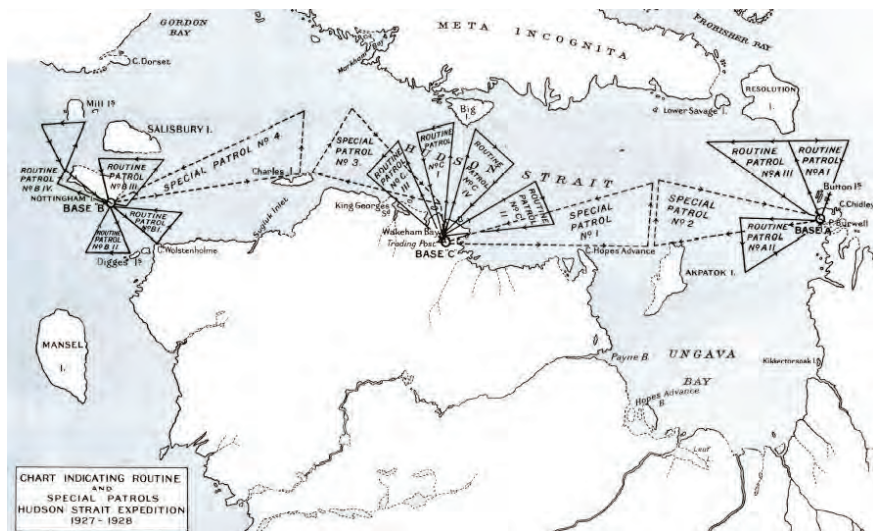
HUDSON STRAIT EXPEDITION

The Hudson Strait Expedition in 1927-28 was sent into the field to determine an absolute time limit for Marine Navigation, to test the use of aircraft as an aid to navigation, and to test the possibility of establishing air operational bases in the Hudson Strait.

On July 17th 1927 the expedition consisting of 44 permanent personnel aboard the Canadian Government Ice-Breaker *Stanley* and non-permanent personnel such as construction men together with all supplies and equipment aboard the SS *Larch* sailed from Halifax to Port Burwell, this being the tentative location for the first of three bases, known as base “A”. The other two were to be located at Nottingham Island, base “B”, and at Wakeham Bay, which would be base “C” and the Headquarters base.

Port Burwell was reached on 27th July 1927 and the “Moth” Seaplane carried on the after-deck of the *Stanley* was launched for the purpose of locating a suitable base.

As the early fall ice first forms at the western entrance to the Strait, it was desirable to establish bases in sequence from west to east, rather than east to



Map 3-2: Chart Indicating Routine and Special Patrols, Hudson Strait Expedition, 1927-28. Source: DHH 73/1324.

west. Accordingly it was decided to leave an investigation party at Burwell to thoroughly explore Port Burwell and vicinity for the most suitable base location. The officer in charge of this base, his medical officer and two airmen, together with a motor-boat, supplies and equipment for two months, were left here to carry out the investigation and the remainder of the expedition proceeded west towards Nottingham Island.

On the early morning of August 3rd, a flight making the complete circuit of Nottingham Island was carried out. A very close survey of the shoreline was made and one suitable site only was selected for further observations from the sea and land. It was impossible to observe the entrance from the ships themselves, so it eventually became necessary to cruise along the coast in a small motorboat to locate the proper entrance. Careful inspection of the cove and its vicinity indicated this to be a suitable site for operating from, by no means perfect, yet the best available in such a rugged country.

It took two weeks to complete unloading operations and to provide sufficient temporary accommodation for the use of personnel. Seven hundred tons is a close estimate of the amount of supplies and equipment unloaded during these two weeks, all of this material being towed from the ships, about one mile off shore to the beach by the use of surf boats and a scow. Crawler tractors were used to great advantage in keeping the bench clear of equipment as unloaded. Tide and fog proved to be the greatest impediment to unloading activities, it becoming necessary to work the tides in order to approach the

beach. At times such dense fog was encountered as to cause considerable lost time, tow boats and their tows actually becoming temporarily lost between the ships and the entrance to the base cove and vice versa.

On August 18th, after leaving ashore the permanent personnel of this base together with their constructional staff, both ships proceeded on their way to Lake Harbour to carry on with the establishment of Base "C", the C.G.S. *Stanley* to return later in the year to collect the construction crew for passage South.

The topography of the coast-line for miles on either side of Lake Harbour and in the Harbour itself made the unloading of such a large amount of equipment and the establishment of a base impracticable in the short season at our disposal. Big Island was also visited and while a very fine land locked harbour was found to exist on the South side of the island, there was hardly a semblance of a flat beach or any possible terrain [for] the erection of buildings.

From photographs and snap-shots the country around Wakeham Bay seemed to be more desirable. This appeared to be the only solution for the establishment of this base at some point about halfway up the Straits. Both ships then proceeded to Wakeham Bay, where anchors were dropped on August 24th, 1927.

A short flight in the "Moth" and a ground survey of the best location sighted from the air very soon decided the site for Base "C".

Unloading operations at Wakeham Bay were completed by September 11th, 1927, and after leaving ashore the permanent personnel and construction crew for this Base, eighteen and twelve in number respectively, both ships proceeded to Port Burwell to establish the third and last Base, Base "A".

Unloading conditions were somewhat similar to those experienced at other bases, possibly somewhat harder due to a more rugged beach, and a depleted unloading crew. Being the last base to be established though, and the programme of establishment now being so well advanced, the same rush as necessitated at the other bases was not essential.

Operations General

Routine patrols were to be carried out daily from each base, weather permitting, and special patrols, on which aircraft from bases "C", "A", were to rendezvous in certain areas between their respective bases, on the same phase. This latter system was adopted to provide for the collection of information throughout the length of the Strait as closely as possible within the same period of elapsed time. Special patrols were only called for when considered essential.

Operations using the Fokker seaplanes in the Summer and Fall of 1927 were not very extensive, for two main reasons: bad weather and lack of time, the



Figure 3-3: RCAF Air Base "B" at Nottingham. Source: Hazel Montague / Military Communications and Electronics Museum

permanent personnel having too many duties other than flying to take care of; duties too important in the establishment of the bases before winter set in, to be put aside.

First patrols using Fokkers commenced at respective bases as follows:-

Base "A" - October 23rd, 1927.

Base "B" - October 11th, 1927.

Base "C" - September 29th, 1927.

From the time ice (other than shore ice) first appeared in the Straits, until the freeze-up, conditions became unfit for further flying on pontoons with very poor flying weather existing due to rain, snow and fog.

Conditions became such that flying could be consistently carried on with using skis, at respective bases starting from and continuing to, as follows:

Base "A" - December 13th, 1927, to May 22nd, 1928.

Base "B" - November 23rd, 1927, to May 30th, 1928.

Base "C" - December 12th, 1927, to June 18th, 1928.

From the time flying using skis became possible, every effort to carry out routine patrols was made up to January 25th, 1928. At all three bases regular routine patrols up to January 25th, 1928, suffered from the very bad weather conditions, especially Base "A". Snow and fog were the worst conditions met with and for the greater part of the time very low and limited visibility existed

with the hills and mountains in the vicinity of the bases being totally obscured for days on end. Over the Strait almost continuous fogs and vapours prevailed, no doubt rising from the areas and leads of open water.

During the winter and spring flying on skis, there were three occasions on which some concern was had for personnel and aircraft being away from their bases, lost or forced down by bad weather.

The first of these incidents happened when Flight Lieutenant (F/L) A.A. Leitch, MC, DFC, was returning from Erik Cove at Cape Wolstenholm to Nottingham Island. When about half way across to the Island snow storms were encountered and F/L Leitch, having flown on for a sufficient length of time to have brought him to his base, and still not sighting land, decided it better policy to land on the floe of ice and await clearer weather, rather than remain in the air and consume his supply of petrol. A landing was safely effected on the floe ice, which was not very heavy (about six inches thick), oil was drained from the engine and the crew made themselves as comfortable as possible. Clearer weather prevailed the following day and although land was not in sight, FA Leitch made a calculation of his error and decided to take off. Using the available engine heating unit carried in the emergency kit of the plane, the oil was heated and the engine started without trouble flying as per his calculations. Leitch followed the northeast course from his forced landing point and was successful in picking up land, which proved to be the extreme northwest end of



Figure 3-4: F/L AA Leitch on the shore at Base "B" located at Nottingham Island with Fokker Universal aircraft G-CAHJ in the background. Source: Hudson Strait Expedition/ Military Communications and Electronics Museum

Nottingham Island. The aircraft arrived back at its base with about one quart of petrol in the tanks. The temperature at this time was approximately 15° below, but only a few minor frost bites were experienced by the personnel.

The second incident [occurred] when S/L T.A. Lawrence was proceeding from Wakeham Bay to Nottingham Island in early January, 1928. Heavy snow storms were encountered about twenty miles east of Cape Digges, and the pilot proceeded to return and land at Sugluk Inlet to await better conditions. The following day another attempt to get through to Nottingham was made and equally had weather encountered. Decision was then made to return to Wakeham Bay, but again snow storms encountered near Cape Wegges forced a landing to be made in Deception Bay. Here the aircraft and crew were forced to remain for 9 days during which time typical Arctic weather and storms prevailed. On the eighth day while making ready to take off, a search machine arrived from Wakeham Bay. By the time the machine, which had been exposed to the weather for 8 days, was dug out and made ready for flight, the short day was almost over. Both machines, therefore, stayed overnight at Deception Bay returning to their base at Wakeham the following day.

The third and last incident came very closely to a [disastrous] ending when F/L A. Lewis, with a mechanic and native on patrol from Port Burwell became lost in a heavy snowfall on their return from Resolution Island. After picking up a point of land, which he felt certain he recognized, Lewis took up a course to bring him out at Port Burwell. After following this course until the petrol supply was exhausted, a forced landing was made on rough hummocky floe ice. The crew fortunately were unhurt and while the machine had only minor damages it became necessary to abandon it. Lewis and his party, carrying their emergency kits, started east across the ice and only after one full days travel in that direction did they realize they were actually on floe ice in the Atlantic Ocean off the Labrador Coast and not in Ungava Bay, as they had at first estimated. Then they travelled westward for seven days, reaching the Labrador Coast after much privation and hard travelling. During [this] time their food supply became exhausted and they were forced to live on raw meat, from a walrus shot by their native companion. The ice over which the party was forced to travel was very rough and highly rafted. Endless lanes of open water had to be crossed, these crossings being affected by the use of the inflatable rubber raft carried as part of the emergency kit.

After reaching the land, F/O Lewis and his party travelled north along the Labrador Coast for four days. During this time they saw no signs of life of any description, human, animal or bird, and having no fuel for their primus stove, suffered greatly from cold, hunger and exposure. On the fifth day they were favoured by fortune and came in contact with an Eskimo hunter and his wife.

Through their native companion they were able to make known ... their requirements and arrange for food (of a kind) and transportation by dog-team back to Burwell, at which point they arrived at midnight on the thirteenth day of absence from their base.

During the absence of Flying Officer Lewis and his party, three machines, one from each base, were engaged in search by air for their whereabouts. The period of their being lost, however, was the coldest and stormiest part of the winter and out of the thirteen days elapsed, flying was utterly impossible on all but three days. Out of necessity the three aircraft were kept outside at this time and despite all efforts towards their protection filled up with fine driven snow every night, which entailed endless work cleaning them out every day as well as warming up engines and keeping a take-off and landing runway fit.

Summer 1928 - On Pontoons

The interval between flying using skis and the time of using pontoons in the Spring and Summer of 1928, varied at respective bases due to local conditions encountered. The period during which flying was impossible was as follows:-

Base "A" - May 23, 1928, - July 1, 1928 (inclusive)

Base "B" - May 31, 1928, - July 1, 1928

Base "C" - June 19, 1928 - June 29, 1928 (inclusive)

At Bases "A" and "B", the harbours used for flying from were in close proximity to the Strait, and in consequence the ice broke up early. After breaking up, these harbours failed to clear of drifting ice which was constantly going and coming with the tides.

At Base "C", Wakeham Bay, the harbour was some eight miles from the Strait and the ice actually melted away and, once weak enough to be broken up by the action of the tides, soon disappeared and did not return. Only eleven days were lost at Wakeham Bay from the condition as compared with thirty-eight and thirty at Bases "A" and "B", respectively.

From the time of commencing flying using pontoons, in 1928 until August 3rd, operations were carried out in accordance with previous original orders. On August 3rd, navigation conditions were such that further aerial observations were unnecessary, their being no ice in the Strait. Recommendations were then made to the leader of the expedition to have flying operations cancelled and to commence at once the conditioning of aircraft for the flight south to Ottawa, it then being the intention to fly all serviceable machines out from the area of operations.

An attempt was made to fly the aircraft out, but due to the unserviceability of machines it was considered to be too great a risk, and the aircraft were shipped aboard the *Canadian Voyageur*.



Figure 3-5: The recovery after a flight on floats was a hazardous and a cold task because of the rocky beach. Source: Hudson Strait Expedition/ Military Communications and Electronics Museum

Operational and General Flying Conditions

The general flying conditions met with in the area covered by patrols of the expedition were very erratic. Some of the conditions encountered have already been dealt with such as interseason conditions at the freeze-up and the ice break-up. The early formation of shore ice before the harbours froze and the rough rafted conditions even. after the harbours did freeze was a serious draw back in the Fall 1927, in that it prevented getting aircraft into the water and on to the ice for flying at the particular time when aerial observations were most essential at the close of marine navigation.

Formations of shore ice and drifting ice in the harbours presented their difficulties in the Spring of 1928, and caused a long break between regular patrols, particularly at Bases "A" and "B". The Spring interval during which no flying could be carried on with did not cause any loss in the collection of information as to marine navigation, however, as navigation for shipping did not become fit for some weeks after flying on pontoons started in 1928.

At no time during the flying season when skis were in use did the conditions of the ice, or snow on the ice, seriously hinder flying, and that for never more than one day at any one time, when the levelling down of a few hummocks of ice or snow-drifts soon righted this condition. In fact the ski flying was for the most part ideal, insofar as aerodrome conditions were concerned.

With the exception of a few weeks in the Spring, mostly in May and early June, the weather was never very good for any appreciable length of time. Fog and vapour over the Strait was more the rule than the exception. There were periods when the visibility was very good, but a very limited ceiling existed with

the coastline almost completely obscured under banks of low lying clouds and fog.

In addition to the weather conditions encountered, actual flying was not assisted in any way by the proximity of operations to the North Magnetic Pole or by the inaccurate charts and maps. The approximate magnetic variations throughout the Straits is given as 45° west. This figure is certainly not constant even for short periods of time, varying from 45 to 50°. Four types of compasses were available for use: the Pioneer Magnetic, the Earth Inductor, the P4 Aperiodic and the Bumstead Sun Compass. The magnetic compasses were all very erratic at any time, but there were several localities when it was utterly impossible and unsafe to attempt to navigate by using them. A particularly noticeable action took place in the compasses in the vicinity of any Capes, such as Cape Hopes Advance, Cape Digges and Cape Weggs.

The maps and charts, those the only ones available, were very inaccurate. Some parts of the coast-line were not recognizable when compared as actually seen and as charted. Countless islands existed which are not charted and others charted are incorrectly located. As well, the contour of the land is not very well depicted and all of these features make aerial navigation somewhat difficult, and especially in the winter when it was almost impossible to recognize landmarks or tell land from ice when covered with snow. The only way in which one was actually able to arrive at the proper compass courses to be followed on patrol was by making careful checks and observations while flying over the patrol route on days when visibility was very good and flying from point to point within sight of each other, and noting the compass readings.

Photographic Conditions and Photographic Equipment

The general weather conditions which existed did not prove very fit for successful aerial photography over a very extended part of the year. On many days when patrols were made, there existed a layer of low haze over the ice and water which hindered the photographic work. The condition was very prevalent in the Fall and early Winter of 1927, and up to the early part of 1928 aerial photography was practically a washout. At that time the days were very short, and the sun, even when not obscured, was not very bright and was low in the sky. From January to August, however, the conditions were much better, while in May and June they were almost as perfect as could be desired for a fairly large percentage of the days.

General Remarks on Flying Clothing

On February 19th, 1928, with a ground temperature of 30° below freezing, there was occasion for a flight of 3 hours and 40 minutes duration. During the

greater part of this flight an altitude of 8,000 feet was maintained, when the temperature was approximately 56° below zero, and on landing the pilot was very comfortable. The following clothing was worn by the pilot: silk underwear under medium weight wool under chamois, leather breeches, flannel shirt, wool sweater, duffle socks, moccasins and sheep skin lined flying boots, deer skin mitts with duffle interlining, leather and skin lined helmet, face mask was modified to fit, fur lined mask, goggles and outer sidcot suit.

Light wind-proof, two piece outer flying suit, worn in pyjama style with the upper portion designed after the Eskimo parka without the hood but rather with a deep collar adjustable by means of a drawstring, was recommended. The pants portion was made free and fastened around the waist with a draw-string, the top portion long enough to tuck under the pants. The shirt cuffs and the pant legs fitted snugly and were adjustable by either elastic or short [zip-fasteners], the shorter the [fasteners] the better. This type of suit proved sufficient with proper underclothing and was very easy to put on and take off.

Deer skin mitts with long cuffs and chamois lining were suitable, summer deer skin only being used as the hair comes out of the winter deer skin.

Suede face masks made to individual fits with no nose piece and a fringe of clipped wolverine fur around the cheeks and chin were considered worthy of trial.

General Living Conditions

The general living conditions at all three bases were very much on a par. No direct sense of isolation was actually felt as there were sufficient personnel to eliminate to a large extent that feeling of monotony which would culminate from a very few people living together under similar conditions. There existed a hearty cooperation between the officers and men of the service units engaged on the expedition. The discipline and esprit-de-corps was very good, there being only one instant where a charge sheet was required and that within a few days of the completion of the expedition. One has no hesitation in commenting that, but for the initiative, work and example set by the service personnel (all ranks) of the expedition, the three bases would not have been established in 1927.

As has already been recorded, the quarters were such that no great discomforts were had. Nothing did lack in variety and fresh meats. Aquatic game existed in quantities such as seal, white whale, walrus and occasional fish, the latter being more plentiful at Nottingham Island than the other bases. One has to acquire a taste for any of these foods, other than fish, and the acquirement might be made easier if there were no other food available, even can sausage. Seal liver does make a very palatable dish and the seal flesh quite passable when properly prepared. Its preparation seems to be an art. In the



Figure 3-6: Ice blocks insulate huts in the north. Source: Hudson Strait Expedition/ Military Communications and Electronics Museum

vicinity of Bases “A” and “B” there existed, in season, sufficient amount of land game such as white bear, ducks and ptarmigan, with an odd caribou at Nottingham, to provide a reasonable quantity of fresh meats, At Wakeham Bay land game was very scarce and the lack of fresh foods much more keenly felt. An instance of conditions occurred in December, 1927. The RCMP member of Base “C” made a 21 day hunting trip to the south of Wakeham Bay. This trip was made by the constable with one native and dog team, with sufficient rations for about one month. They returned to the base after their 21 day absence and reported never having their rifles out of their cases. During their trip they had been inland for about 200 miles. They did manage to catch five fish.

For pastime the personnel had the sporting equipment, libraries, radio, and certain personnel had skis and snowshoes. Some had even taken along a few golf clubs and strange as it may seem this game could be indulged in for considerable periods of time during the winter months. The snow on the Bay ice at Wakeham for the greater part of the winter presented a hard wind packed surface, and with the balls painted a dark colour, golfing was not at all impossible. All personnel had keenly looked forward to the coming of the trapping season, and on its commencement the setting and visiting of traps originated one more source of sport and exercise. Unfortunately, the season proved to be a very poor one and continuous hikes to find empty traps, more often lost ones, brought this pastime to a somewhat early close.

There was one fatal casualty on the expedition, that when an oiler of the ice-breaker *Stanley* fell into the crank pit during the first night out from Halifax, from which the expedition sailed on July 17th, 1927. There were no injuries

from flying accidents and only two minor injuries among permanent personnel of the expedition. These were two broken ribs, both occasioned by back-fires of motor-boat engines. The health of the personnel was extremely good, noticeably free of even colds. There was one case of Scarlet Fever at Base "C", but this was confined to the one isolated case. At none of the bases was any great inconvenience or trouble experienced by personnel coming into close contact with the natives. Occasions did arise but the presence and assistance of the RCMP constables helped to hold these to a minimum. Native families were employed at each base, the men assisting in general work around the bases and driving dog teams when required. The women made and repaired items of clothing, such as boots, mitts, socks, and parkas, and in some cases were capable of washing clothing. The head of each native family received a credit of \$40.00 per month, plus an issue of rations for himself and family, plus a bonus for work carried out by the women.

FLYING OFFICER A. LEWIS

The following is a summary of F/O (now G/C) Lewis' narrative "Adrift on Ice-floes" in which is included his observations on Port Burwell and his experiences while lost after forced landing on the ice.

Port Burwell

"Port Burwell situated at the most northerly tip of the Labrador coast and at the most easterly outlet of the Straits was named by the Eskimos 'Killiineck' the literal translation of which is 'the end of the earth'. No better title could so aptly describe it and the Eskimos there firmly believed that 'Killiineck' was truly the end of the earth and that sea and ice extended to eternity from there.

"Port Burwell is a barren waste of bare, windswept rocks with not a tree, shrub or a blade of grass to be seen. Its bleak, jagged cliffs, hundreds of feet high and most of the time shrouded in fogs or mist, are a veritable nightmare to pilots returning to their base after long patrols with little fuel remaining in their tanks.

"Animals will not deign to make their home there. Occasionally a lone polar bear will stray ashore from an ice-pack but finding nothing to hunt and eat will return to the ice-pack where at least he may eat his fill of seal and fish. In the spring, a kind of Ptarmigan appear out of nowhere, lay their eggs in the cliffs, then disappear not to be seen again until the following Spring. The eggs are large, roughly the size of Ducks' eggs and very palatable, providing a welcome variety to an otherwise monotonous diet.

"The staple food at Port Burwell, as indeed at every other Arctic outpost, is seal and, next to seal, fish and, next to fish, Walrus in that order although



Figure 3-7: F/L TA Lawrence (with goggles) and Lewis preparing to fly at Lake Harbour, Baffin Island. The flight was made while looking for a suitable site for setting up of Base "C" during the Hudson Strait Expedition. The plane pictured here is a de Havilland DH-60 Moth that was later lost during a storm. Source: Hudson Strait Expedition/ Military Communications and Electronics Museum

Walrus were to be found only farther out to sea and only the more hardy of hunters would venture out so far [to hunt walrus] and again more equipment was required such as harpoons, long lengths of walrus-hide for lines, and more men and [kayaks] to bring home the spoil.

"Seal is definitely an acquired taste; at first it tastes unbearably fishy but after a while the desire for fresh meat of any description overpowers this aversion and eventually it becomes quite palatable. In appearance when cooked, it appears much like beef and cuts like it. Seal liver is quite a delicacy and strangely enough has little or no fishy tang and is simply delicious fried with bacon. To the Eskimo, seal is manna from heaven. It provides him with practically everything he needs, food: clothing, boots and covering for his igloos during the summer thaw.

"Walrus, although fishy, is much more palatable to eat than seal and not unlike beef in flavour; walrus meat provides a valuable change to the diet and is rich in protein and vitamins and in addition the hide is invaluable for making into such useful things as harness for the dog-teams, thongs for whips, and straps for lacing together the wood for the komatiks. The ivory from the tusks is

fashioned into harpoons, needles, fishing-hooks and all such useful things normally made of iron and steel in civilization.

“Polar-bear when young are excellent as fresh meat but fishy and comparatively tender, the older polar-bear however are extremely tough, and good only for boiling down to blubber. Polar-bear hide is much sought after and valuable in Eskimo terms of barter.

“The fish is probably the best in the world; Arctic cod from ice-cold water literally melts in the mouth when cooked and the salmon-trout from the inland lakes in wintertime would fetch fabulous prices in New York City. Fishing is simple in the Arctic; during the short summer the water is clear and ice-cold with the fish still unsophisticated in the wiles of man. Then all one has to do is to drop a line with two or three unbaited barbs secured to it and then wait-for the rush; cod will appear from all angles and dive for the hooks. The water being absolutely clear it is simple to watch for the psychological moment and pull cod up three at a time.

“During the winter months the Eskimo loves to trek inland to the inland lakes, bore holes through the ice and fish through them. Either the attraction of light or the suction of air or both bring quantities of beautiful fish to the holes and large numbers of fine salmon-trout may be secured in a remarkably short time.

“Bleak and lonely the Arctic may be but life there has its compensations: there are no financial problems for the simple reason that money simply doesn't exist, unlimited food for the catching, clothes for the hunting, snow-houses for the building, no morals between the sexes, yet no immorality for the true nomad Eskimo is concerned only with the present and his immediate desires. It is only when we so-called civilized white men attempt to convert him to our distorted ideas of present-day civilization that he becomes likewise venal and jealous of his neighbour's goods. The forbidden is ever attractive and despite our teachings he will continue his way of life but guiltily and develop into a stealthy and sly individual.

“In his natural, nomadic environment there is no better human living. He is sublimely unsophisticated, generous to a fault to the extent that he will share anything he possesses, including his women, with anyone who is without. After a hunting expedition his first action is to share his spoil with the rest of the villages. A visitor likewise is treated handsomely: he is feasted and decked out with fresh clothing or his worn clothing mended, his seal-skin boots or mukluks are chewed soft by the women and when he is ready to sleep he is provided with an Eskimo woman to keep him company through the long Arctic nights. On the morning he is supplied with fresh dogs to speed him on his way.

“An Eskimo’s whole existence depends on hunting therefore male children are preferred to female. It has been whispered that new baby girls have been placed out on the ice to be frozen to death when not wanted, or thrown into the sea, but such rumours should not be given much credence.

“The Eskimo woman is a [magnificent] sempstress and a born boot chewer. She is responsible for the manufacture of all clothing including the [magnificent] parkas of caribou, polar-bear and sealskin and also the completely water-proof sealskin boots. Her sewing of the boots is a masterpiece of craftsmanship; with her ivory needle she penetrates into only half the thickness of the skin and creates a perfect waterproof joint unequalled by any professional boot factory.

“After a day’s hunting, seal-skin boots become hard and stiff and uncomfortable on the feet, this is rectified by the women who, when the men return home, take their boots and for the rest of the night until sleep time chew them until the natural oils of the skins reassert themselves and render the boots soft and pliable. As a result of this perpetual chewing an Eskimo woman’s teeth are worn down flush with the gums.

“The male Eskimo, although gifted with little natural initiative, is at the same time a marvellous imitator; if he is shown anything once he will copy it exactly without a flaw. He has a marvellous sense of humour and will roar with laughter at the simplest jokes. He attains amazing skill at practical handicraft, yet seldom becomes sophisticated or cynical and retains the mentality of a child of fourteen for the rest of his adult life. With no worries, responsibilities or other cares he cheerfully passes his life, hunting and fishing, eating and sleeping, with no thought of the future and no thought of death or survival after death.

“The Eskimo is probably a throw-back of a Mongol race which perhaps filtered through the centuries from the continent of Asia through the North West Passage to the North-American continent. It is singular that like the Chinese, tea is a natural beverage. He revels in it to the extent of eating the tea-leaves after he has finished the brew. He loves tobacco and is seldom seen without a pipe in his mouth, the women included, and smokes the strongest concoction he can get hold of which is usually chewing tobacco soaked in molasses and rum.

“The average Eskimo is a little man about five foot tall, but strong and sturdy with a thick layer of fat all over his body. He never washes but plasters himself with blubber fat and oil to keep the cold out and the heat in. The first impression one gets of an Eskimo is registered by the sense of smell. At first he appears to smell like a pole-cat, and the women in particular, but as the months go by one becomes more accustomed to their particular odour and after a time

they appear to smell quite normal and the women become quite good-looking although at first they are really quite hard to take.

“Such were our neighbours around Port Burwell, Wakeham Bay and Nottingham Island during the year 1927, an epic year for the Eskimo for that was the first time in their history that the aeroplane was introduced to them. It is interesting to recall that except for a few of the very old Eskimos who regarded it as a visitation from the Gods, the aeroplane did not surprise them unduly much to our astonishment; apparently the reason for this was that they had always taken it for granted that the white man could achieve anything, but on the other hand they have such a high regard for their own ingenuity that they firmly believed that if they had access to the same resources and facilities as the white man, they also could do likewise.

“The Eskimos took to flying as they did to their [kayaks] and komatiks and were not in the least disturbed when they left Mother Earth. Their ideas of geography were altered somewhat for they were able to see with their own eyes that, instead of living on the end of the earth, there were other lands on the other side of the water. Frequent flights were made to Baffin Island across the Straits from Port Burwell and at least one Eskimo was always taken along to give expert assistance in the building of igloos in the event of a forced landing, likewise the Eskimos of Baffin Island were similarly apprised of the fact that other lands existed and that other humans existed on them.

“Many years before, it so happened that Port Burwell had been chosen as a site for a Moravian Mission by a group of Moravian Missionaries who had been sent out from their native land to convert the heathen Eskimo to the ways of the Christian faith. It was doubtless selected for this purpose for the reason that it was the most god-forsaken place in the universe. The name Port Burwell is misleading. It gives one the impression that it is a flourishing, sea-going port yet nothing could be farther from the truth; actually all that exists there are a Hudson Bay Co. Post, a Mounted Police Post of two Mounties, and the old Moravian Mission building. The Moravian missionaries had long since departed whence they came, doubtless disillusioned by what they saw and leaving the heathen Eskimos to convert themselves in their slough of despond.

“What really mattered to us however was the fact that a building already existed and that much valuable time and material would be spared. All that was necessary to construct were the large hangar for two aircraft including the workshops, a blubber-house and toilet facilities. This permitted a much shorter construction period at Port Burwell and the time thus saved was used to great advantage at the other two bases, where few facilities existed.

A forced landing on the ice-floes

“On the 17th of February 1928 at approximately 11 o'clock in the morning, I departed from Port Burwell on a regular ice-patrol piloting Fokker aircraft G-CAHE with Flight Sergeant Terry as Engineer and an Eskimo named 'Bobby' who incidentally had only one eye and who was known as 'Bobby the one-eyed Eskimo.'

“Our route that day was direct across the Hudson Straits to Resolution Island, half-way up Frobisher Bay, returning across [Grinnell] Glacier and the Straits back to base. There were no weather forecasting facilities in those days so that each flight was always a bit of a gamble as far as the weather was concerned.

“Weather and visibility on the outward trip were reasonably good but deteriorated rapidly on the homeward trip to the extent that having crossed Grinnell Glacier on Baffin Island and having reached the Straits we ran into heavy snow of blizzard and hurricane proportions. I was forced to let down to within a few feet of the ice-pack where accurate navigation became well nigh impossible, what with the local magnetic disturbances, the oscillations of the compass needle, the extreme turbulence of the air and almost zero visibility. I was endeavouring to allow for at least 20 degrees drift to the port but it was more guesswork than technique for my chief problem was to keep right-side up by visual means for there was no such aid as a directional gyro or a turn-and-bank indicator.

“It was obvious that it would have been next to miraculous for us to have reached our base under these conditions and in any event by this time our fuel was almost exhausted and barely enough to have reached home under ideal con-



Figure 3-8: Fokker Universal aircraft G-CAHE is prepared for departure. Source: Hudson Strait Expedition/ Military Communications and Electronics Museum

ditions. It was imperative that a decision be made immediately for total darkness was rapidly approaching and there were only two alternatives open to us: either to run out of fuel and then attempt a landing without an engine or to find a reasonably level stretch of ice and use our last drop of fuel by making a power-on landing. The hurricane was of such proportions that by landing into it there should be practically no run after touching down, practically eliminating any danger of a head-on collision into any of the numerous ice-pinnacles.

"The aircraft was fitted with a radio transmitter for key only but no receiver.² Voice transmission from air to ground and ground to air had not yet been adopted as standard procedure and was still in an experimental stage, so using the key I tapped out a message to base informing them that I was lost and was about to effect a landing on the ice-pack and that I was unaware of my exact location having been thrown considerably off-course by the storm.

"I now held the aircraft dead into wind and proceeded to look-out for a suitable place to land. At times we were so low that I was obliged to dodge pinnacles. Visibility was so poor that it was impossible to climb over them.

"Terry, back in the cabin, told me afterwards that to him it was a veritable nightmare watching tall pinnacles of ice rushing past the windows of the aircraft at terrific speed expecting each moment to be his last. Suddenly I saw immediately below what appeared to be a stretch of clear, greenish ice and fervently praying that it extended ahead at least a short distance I cut the engine whereupon the aircraft dropped like a stone almost vertically and then, using the engine for a short burst, I set it down on the ice and immediately cut the switches. When we hit the ice, so strong was the wind that the aircraft stopped almost immediately but the pinnacles were so numerous that we could not avoid hitting one head-on and the aircraft finished up with the tail up in the air and the nose and [skis] buried in a deep snowdrift against an ice-pinnacle.

"I was thrown half out of the cockpit and it was an easy jump on to the ice. At the same time Terry and 'Bobby' the one-eyed Eskimo appeared out of the cabin door. When we looked around at where we had landed, it seemed a miracle that we were not all killed and it was obvious that only the speed of the hurricane had saved us.

"However, we were down safely without injury although Terry told me that while I was busy making the landing 'Bobby' tried to leap out of the cabin door and it was only by throwing him down on to the cabin floor and placing his heel on 'Bobby's' neck that he was able to prevent him from so doing.

² Short radio messages could be sent in Morse Code but not received. Voice transmissions could not be sent.

"It was now quite dark and the immediate job was to build an igloo as quickly as possible if we were to keep from freezing to death for it was deathly cold and the wind seemed to blow right through us.

"We used the drift in which the aircraft had finished up and the three of us working fast were able to complete our first igloo in about half-an-hour. Our sleeping-bags and other emergency equipment we had previously taken out of the aircraft, and when we were comfortably inside we made some hot tea. We had no sugar or milk but it tasted like nectar straight from the gods.

"It was a great temptation to keep the Primus burning for it imparted to the little igloo a great feeling of comfort but it is most essential to extinguish any source of heat as soon as possible for if this is not done a gentle rain will fall as the inner surface of the igloo melts. We decided not to consume any of our emergency rations for we had had breakfast before taking off and from now on we would eat only when it was absolutely necessary to maintain our strength. We decided however at this juncture to take an inventory of our rations and organize a method of rationing for the future. To do this it was first necessary to determine the maximum length of time the rations would have to last.

"In the first place we were not exactly sure where we were except that we knew that we were out at sea and not on land. If the reader will try to visualize a chart of the Hudson Straits and imagine that he is flying towards Port Burwell from the Eastern tip of Baffin Island, he will quickly appreciate the situation. Port Burwell forms the apex of a triangle with one of its sides the Labrador Coast and the other the Eastern coast of Ungava Bay. I had no idea which side of the apex of the triangle I was on, in the Atlantic Ocean or in Ungava Bay.

"We finally decided that if we did not reach safety in fifteen days the rations wouldn't be of much use anyway for our survival. After that length of time in the middle of an Arctic winter and out in the open would be highly problematical. We then proceeded to divide up the six slabs of chocolate, the hard-tack biscuits, and the Horlick Malted Milk Tablets with mathematical precision, first of all into three equal parts, then each part into fifteen equal parts representing fifteen days rations. I, being the senior of the three, made myself the custodian and distributor and stowed them away as part of the load that I would have to carry.

"There appeared to be much more tea than we were likely to consume in fifteen days and the kerosene if used sparingly should also outlast this period. In addition, if we were lucky, we might come across some living thing to shoot with our B.S.A.[Birmingham Small Arms]: a seal, walrus or polar-bear.

"The Primus being now extinguished and the tea consumed there was little else to do but climb into our sleeping bags and work out our future plan of action. In which direction to walk, East or West, it was a tossup. If we were in

the Atlantic then by walking East we would arrive nowhere and would eventually reach water with our rations exhausted and no possible chance for survival. On the other hand by walking West we would eventually reach the Labrador coast. If we were in Ungava Bay then by walking either east or west we would strike shore and there would be no gamble as to direction at any rate. We fervently prayed that we were in Ungava Bay.

"In reconstructing the flight in my mind over and over again, I came to the conclusion that we must be in Ungava Bay for I had been allowing at least twenty degrees into the drift to correct for the North-West gale. I couldn't reconcile in my mind the fact that any gale would require a greater correction than that and that if anything I had over-corrected and must be in Ungava Bay. With that decision firmly fixed in my mind I decided that on the morrow we would walk East towards the Labrador mainland. This decision was made almost on the toss of a coin and I felt that the chances of our survival depended on it. How wrong I was will be proven later.

"With that decision settled to my satisfaction, I tried to sleep but with no success. Terry was having the same difficulty and must have been very apprehensive as to the outcome of our adventure but he certainly didn't show it. With perfect aplomb and no outward sign of fear he cracked jokes and remarked that he trusted implicitly to my judgement. Never at any time did he question my decision either then or at any other time, he was that kind of man, a perfect N.C.O. (non-commissioned officer) with an inborn discipline born of a lifetime in the Service and an excellent tradesman. It would never have entered his head to question any order irrespective of where that order may lead him, regardless of danger.

"We were both Englishmen, he a Cockney, born within the sound of Bow-Bells, and I a Bristolian and proud of my heritage for being born in the City of the 'Merchant Venturers' and the City from which Sebastian and John Cabot sailed to discover the New World. I attended College in the shadow of the Cabot Tower situated on the highest point of Bristol on Brandon Hill, a memorial erected to his memory and one which had a profound influence on my early career and prompted me in later years to visit and eventually live in the land of his discovery. As I pondered over our critical situation I wondered what John Cabot would have done under like circumstance and it passed through my mind that he must have survived much more fearful odds than lay before us and this thought gave me much cheer and courage.

"During that first long night Terry and I talked of English country pubs, the shows we had seen, our motorcycles and their respective merits and we vowed there and then that if we ever survived this ordeal we would spend our very next

leave in England and toast our deliverance in nut-brown ale in some little country pub buried in the heart of the English countryside.

"When we had rested a few hours and collected our thoughts, we dug ourselves out of the igloo and finalized our plan of action before setting out on our first epic walk; the first thing to decide was the weight of equipment we each were physically able to carry and this is where 'Bobby' came in to the picture. He was a husky fellow, healthy and accustomed all his life to carrying big loads, he could carry at least half as much again as either one of us without any fatigue whatsoever. In addition, he could do with that one eye of his more than most people can do with two. He was a crack shot and seldom failed to bring down his quarry with the first shot; with only fifty rounds of ammunition at our disposal 'Bobby' was going to be worth his weight in gold.

"It is a fallacy however that Eskimos have an uncanny instinct of being able to find their way home by some sixth sense. Unless they have recourse to familiar landmarks they are much worse off than the average white man with his more educated mind. On the other hand, Eskimos have an uncanny memory and will recognize at a glance landmarks over which they may have only travelled once and will set off in the right direction without hesitation.

"Their ability to subsist off the country, construct igloos, their phenomenal stamina and resistance to fatigue and severe cold, is the result of a lifetime of hunting and running alongside dog-teams and consuming fabulous quantities of raw walrus, seal, fish and polar-bear. An Eskimo generates a tremendous amount of heat when on the trek and even under the most severe sub-zero conditions his hands will always be warm even without any covering.

"The clothing of the average Eskimo usually consists of a [Hudson's] Bay Co. Parka made from a kind of woollen 'Duffel', a windbreak Parka of seal-skin, or caribou-skin on the outside, woollen 'Duffel' socks and seal-skin waterproof boots, and Mackinaw trousers.

"Their gloves usually consist of unborn seal next to the skin with ordinary seal-skin on the outside. For our part we were clad in chamois leather under-clothing for flying, 'Duffel' shirts and pull-overs, 'Duffel' socks in shoe-packs, flying helmets and a light eider-down flying suit, very fine in texture and very light in weight. Our gloves were the same as those worn by the Eskimo.

"The seal-skin gloves are of some interest. We found that the only way to keep our hands really warm under severe conditions was to wear unborn seal turned inside-out with the soft, down-like fur next to the skin and ordinary seal-skin gauntlets as a wind-break on the outside. Unborn-seal is beautifully soft, pure white with a soft down-like fur, light and flexible.

"We were therefore all adequately clothed, perhaps even over-clothed for continuous walking and we resolved that if it proved to be too much we would

discard articles of clothing en-route until we had reached the [comfortable] minimum. Our next problem was to decide exactly what we intended to carry with us and what we were going to discard and leave with the aircraft. The first important item was the rations, next the sleeping bags each to carry his own, next the rubber life-raft and paddles for we were sure to encounter many leads before we would reach shore, next the B.S.A. rifle and 50 rounds of ammunition, the compass dismantled from the aircraft and also the eight-day clock, and the smaller items such as clasp knives, fishing line and hooks, snow-knife, matches, etc.

"The division of load took some little time and half the short period of daylight was already gone, so without further ado we set out on our journey. The blizzard of the day before had now been replaced by a strong North-West gale, with overcast skies, poor visibility and a very low temperature which felt like thirty or forty below zero.

"I had decided that the most accurate method of walking would be strictly on a compass course by using the compass as a bearing-compass, so placing it on a piece of ice I took a bearing on a distant pinnacle more prominent than the rest of 144 degrees being 90 degrees plus the 54 degrees westerly variation. After which we proceeded to walk until we had reached that pinnacle and so on until we were forced to call a halt owing to the approaching darkness. When walking under such conditions one normally walks from fatigue to fatigue, but we would have to disregard fatigue and walk from first light to last light. Eskimos when on the move travel from sleep to sleep and do not bother about night and day. They speak of a place being so many sleeps away. The more hardy Eskimos will have fewer sleeps between places than the normal run and take a pride in completing a journey in as few sleeps as possible.

"We could have only walked about two hours that first day yet one thing about the condition of the ice struck me as being very singular and gave me grounds for considerable thought. I had anticipated that if we were walking towards a shore the ice-conditions should improve gradually to the extent at least that the pinnacles should become smaller and the floes less rough for walking. And yet the reverse of my surmise was the case. The pinnacles were undoubtedly becoming taller and the floes rougher to the extent that they were rapidly becoming almost impossible to negotiate. I did not voice my apprehensions to 'Terry' that we were probably walking in the wrong direction but decided to call a halt at once, build an igloo, and reserve our energies until I had thought out this new situation in the [comparative] comfort of our igloo and sleeping-bags.

"We soon found a drift of snow sufficiently deep in which we could build our igloo and in less than half-an-hour were comfortably drinking tea and

[consuming] our meagre ration within [it]. Later I disclosed my fears to 'Terry' but not to 'Bobby, for I could not foresee his possible reaction. I told him that my original estimation of our position was most probably in error and that we were in fact in the Atlantic Ocean and by walking East were walking out to sea. His reaction to that diagnosis relieved my mind somewhat for he replied very simply that all we had to do then was to walk in the opposite direction. Considering this angle still further, walking towards the West must eventually bring us to a shore irrespective of whether we were in the Atlantic or Ungava Bay so we decided to play safe and on the morrow reverse our steps to the West.

"We were now somewhat easier in our minds in that the situation was beginning to unfold itself, even if it were only in the condition of the ice, and we looked forward to the morrow with some degree of excitement with the added hope that the visibility may be good enough for us to catch some glimpse of land. I argued in my mind that if we were really in the Atlantic we could not possibly be beyond the range of vision of the Labrador mountains which are at least from two to three thousand feet high with snow-covered peaks which should stand out vividly in the sky, and so I prayed for a clear day on the morrow which would confirm my calculations of our position.

"The following day broke clear and cold, so cold that the air was alive with electricity. Every movement we made was reflected by crackling sounds in the atmosphere. We were completely surrounded by tightly packed ice-pinnacles and could not immediately sight anything on the horizon, so climbing to the top of one of the pinnacles I was almost afraid to look towards the west for if I saw nothing it would without doubt dash all our hopes for our survival. However when I at last glanced to the west, there, clearly etched in the sky, were what appeared to me to be mountain peaks white with snow. I could scarcely contain my joy at this definite confirmation of my theory. A rough calculation convinced me that we must be about 50 miles out in the Atlantic, for taking into consideration the height of the mountains roughly three thousand feet, in reverse in an aeroplane at three thousand feet on a clear day one has a range of vision of approximately 50 miles.

"With renewed hope and enthusiasm we reversed all our previous ideas and commenced to retrace our steps in a westerly direction. 'Bobby' hadn't the faintest idea what was going on other than the cold fact that we had to keep on walking and making igloos until trusting [implicitly] in the infallibility of the white-man we would eventually arrive back at our base as if it were an every day occurrence.

"Terry and I both realized to the full the dramatic significance of the next step we were about to take. There would be no turning back a second time and

our lives were now at stake. And so with this thought in mind we turned our backs on the east and our footsteps [headed] towards the west.

“During the first hour or so, there appeared to be little change in the formation of the ice-pack and the suspense was becoming hard to bear. The going was slow and most arduous, at times we were up to our waists in snow, and at others walking on perfectly clear, greenish sponge ice which gave to our weight as we walked on it and emitted a weird squeezing sound as it felt our weight. Again, we were forcing our way through tightly packed ice-pinnacles, jammed together at some time or other by a severe storm. Occasionally we were forced to scale such jams to maintain our compass course and eliminate many extra miles of walking in order to circumvent them. It was shortly after scaling one such formation that I thought I detected a change for the better.

“Our stomachs were now beginning to feel the strain of insufficient food in proportion to the consistent, unaccustomed exercise. It would be vitally necessary before very long to obtain some kind of fresh meat.

“The greatest hardship of all was the complete absence of fresh water. We were forever parched for it. It is a fallacy that when one is on the ice-floes and needs a drink of water, all that one has to do is to chop off a piece of floe and suck it. Nothing is farther from the truth; the fact is, when floes and pinnacles are being formed salt is precipitated on the ice and forms a thick crust on the outside. Even the snow in contact with ice becomes tainted as we speedily discovered to our disgust. The only way to obtain fresh snow is to scoop it from the centre of a pile and then melt it in the mouth. I know of nothing in the world less satisfying than a mouthful of snow when one is parched with thirst. It is as if one had swallowed a mouthful of sand, and although it must satisfy the stomach it certainly doesn’t quench thirst and the agony continues. At the end of each day’s march our first action was to melt a quantity of snow over the primus and drink our fill, but we would have given almost anything for a drink of cool, clear water on the march.

“On the following day the temperature was [comparatively] mild but it was snowing heavily with a strong wind from the east and practically no visibility. The going was still rough but the wind was in our favour. Nevertheless, the chances were, with poor visibility, another day would pass without sighting anything to kill.

“After walking for three to four hours we suddenly came to open water: it was a lead about twenty yards wide. We were unable to determine its length owing to the poor visibility but it was probably much too long to consider walking around it. This is where the life-raft got its christening.

“It was fortunate that the wind was in our favour and would practically blow us across the lead but it looked much too frail to carry the three of us at once, so

we decided to make two trips with Bobby as the pilot. He with his lifetime experience of [kayaks] we considered to be the most adept at this sort of thing.

"Then Terry came over on the second trip without incident and immediately we proceeded to deflate the raft, stowing it away in its container and congratulating ourselves on the success of our maiden voyage. However the crossing of the lead had consumed much valuable time and there was little time left for finding a suitable drift for an igloo. The comparative level of the floes on the other side of the lead did not lend itself to the formation of deep drifts and it appeared as if having overdone one obstacle, another and more serious one was rapidly taking its place; that of having to spend a long, cold weary night in sub-zero temperatures out in the open.

"At this point I should refer to an interesting item of our emergency rations which I have purposely omitted until now and an item for the safety of which I had made myself personally responsible and that was a 26 ounce bottle of Hennessy's Three-Star Brandy. It passed through my mind that this was going to be one time when it would be really appreciated and, although I am virtually a teetotaler, the name of Hennessy's Three Star still sounds like music in mine ears.

"We eventually stopped at some low pinnacles jammed together which provided an adequate wind-break and with what little snow there was on the surface scraped together sufficient to form a low enclosure about two feet high behind which we huddled in our sleeping bags huddling close together for added protection. In the lee of the pinnacles we got the primus going and made some hot tea which induced both warmth and comfort into us. Sleep was out of the question for we were apprehensive as to whether we would ever awake if we were unable to keep sufficiently warm. As it was, we were even now too cold to sleep, and it was then I decided that this was a sufficient emergency to justify use of the brandy. Every so often when we felt the cold penetrating into the very marrow of our bones Terry and I would each take a sip and at each sip it seemed as if new life was flowing through us. Bobby wasn't very interested. He had never tasted liquor and had always been warned by the missionaries that it was devil's liquid and we didn't try to dissuade him. I am quite sure that had it not been for the hot tea which we made at frequent intervals and the frequent sips of brandy, we would not have survived to tell the tale and would still be lying in that bleak, icy wilderness where no human being could ever have found us.

"We sang and talked through that long night and Bobby kept muttering under his breath something about 'Jesusee.' At some time in his life had had been taught a smattering of the Christian religion by some missionary and believed what little he knew with fanatical belief. I am afraid we capitalized on this a bit in order to keep up his spirits for, if Bobby had ever given up the

ghost, it is doubtful if Terry and I could have survived with our more limited carrying capacities. Terry and I didn't know many hymns to sing so we sang anything that came into our heads and told Bobby they were hymns so that he hummed them along with us, none the wiser. This was the first and the only time that I had seen Bobby depressed about the outcome of our adventure. His primitive mind was not happy about spending a night out in the open, for no normal Eskimo would dream of doing such a ridiculous thing, but we were able to convince him that in a few sleeps we would be back on the mainland again when he would once again be in his element, and he soon regained his cheerfulness and confidence.

"Terry and I had plenty of misgivings of our own as to the outcome of this affair but we never by even the slightest gesture or whisper permitted him to become aware of it. His knowledge of English was confined to about a dozen words and we conversed with him in his native tongue, a language we had learnt a little during the first few weeks of our arrival in the Arctic. Bobby was blissfully confident that we knew exactly where we were going and how long it would take us and that all he had to do was to pad along with us in order to arrive back at our base in due time. Strangely enough he never even questioned our complete about-turn after the first day yet he must have realized that we were going in the opposite direction. Our complete reliance on the compass intrigued him immensely, and I firmly believe that he thought that it was some kind of crystal bowl into which we could look into the future and it was perhaps this instrument alone that instilled into him his supreme confidence.

"As we lay there that night I tried to estimate the distance we had covered and decided that if at the outside we had been 70 miles out from shore, we should be averaging at least ten miles a day and a total of seven days should see us ashore. That meant we should reach shore in another three days barring accidents. If anything, the going should be progressively better. We decided that when the weather cleared we should be getting a full moon and then we would walk through the night and get off the floes as quickly as possible.

"At the first sign of light and after our meagre repast we went on our way. We had only been walking about half-an-hour when to our intense joy in the half-light the dark shadow of the mountains loomed right ahead of us and as the light improved their peaks seemed to stretch up into the sky out of sight. We seemed to be only a short distance away from them in the half-light but this was only an illusion. We couldn't yet make out the shore line and the ice appeared to stretch out into the distance out of sight. From now on during daylight hours the compass mould no longer be necessary. In the distance and slightly on our right were two peaks taller than the rest towering up into the sky. They were so outstanding that they should be indicated on our maps, devoid though they

maybe of much detail. We had brought our maps with us from the aircraft so consulting them I found a spot designated as 'Four Peaks' approximately 80 miles down the Labrador coast from Port Burwell.

"I came to the conclusion that the two we could see were probably part of this group and if that were so we had drifted for quite a considerable distance South with the Labrador current and would continue to do so as long as we remained on the floes. Theoretically, we should have allowed for this drift by walking at an angle into it towards the shore but we were so completely fed-up with the ice-pack by this time that we decided to disregard drift and reach shore as quickly as possible.

"Labrador was rapidly assuming the quality of a land flowing with milk and honey, for our imaginations had been running riot with us during the past few days. We had visions of fresh-water lakes teeming with fish, seals close to shore, polar-bear and an unlimited supply of snow-drifts for igloos. If we could only reach shore our survival seemed assured.

"On we walked in seemingly endless monotony, in a temperature so cold and dry that our clothing cracked as we walked, when to our utter astonishment immediately ahead of us was a most extraordinary sight. Ahead of us was a wide lead perhaps from sixty to seventy yards wide and in it diving and gambolling were literally hundreds of walrus. We stopped in our tracks for this was the first sign of life we had come across since our forced landing and right before our eyes was more fresh meat than we could have imagined in our wildest dreams.

"The catch was that we were not equipped for walrus-hunting, for we had no harpoon. To shoot a walrus in the water is sheer waste of ammunition for it will merely sink to the bottom. Our only chance of shooting one was to wait until we could see one on solid ice. We must have waited for at least a half-hour when one huge fellow lumbered to the edge of the lead and dragged himself up on to the ice and commenced to roll. Bobby who had been waiting for just this slowly cocked the B.S.A. and with his one eye took steady aim and fired; the walrus leapt several feet into the air and almost fell back into the water again. In fact when we got to him, he was half on and half off the ice and furthermore he was on a large pan which was separated from the main pack by a strip of water about two feet in width which fortunately we were able to easily jump across.

"We jumped on to this pan and immediately Bobby proceeded to cut into the still living animal for although he was stunned by the shot in the head he was still alive and breathing heavily. Bobby cut a huge slab of flesh out of his side and ravenously devoured it, this still living flesh. Hungry as we were for fresh meat we drew the line at living flesh and decided to wait until it was frozen when we could chop it into small squares and swallow them whole.



Figure 3-9: Inuit "Bobby" Anakatok at Base "A" located at Port Burwell. Source: Hudson Strait Expedition/ Military Communications and Electronics Museum

“While Bobby gorged himself we carved out as much meat as we thought we could carry and carried it back to the main ice-pack where we laid it out on the ice to freeze which it did in about fifteen minutes, after which we cut it into small squares and added them to our greatly depleted rations. While we were doing this we swallowed a few of the squares and although we could not taste them our stomachs must have been nourished by the fresh meat.

“This incident was probably the real turning point in our adventure for it had been obvious for some time that the rations were grossly inadequate for the amount of energy we were expending. We had visions of cooking some of our walrus when we reached shore if our kerosene lasted out that long, but at the moment, we intended to conserve our meagre supply for melting snow and making tea.

“It took some little time to get organized again after all this excitement but eventually we collected ourselves together, unpacked the raft, inflated it and

prepared for our second voyage in it across the lead. To do this we were obliged to walk at least a mile along the edge of the lead to select a spot where there were the least walrus. This time we decided to make just the one crossing with the three of us on board owing to the considerable width of the lead which must have been at least a hundred yards wide and also in view of the strong wind from the northerly quarter which would create considerable drift and complicate manoeuvring the raft to the other side.

“Strangely enough the extra weight appeared to make little or no difference to the displacement of the raft but we were certainly very crowded and had to stay very still for fear of upsetting the balance. In actual fact, the extra weight gave it additional stability and made it very much easier to steer and so giving the walrus a wide berth it was not long before we were safely on the other side.

“Leaving Bobby to pack-up the raft, Terry and I went into consultation to decide whether we should continue on the same course and reach shore as quickly as possible or strike diagonally into the drift and cut off a few miles of coast. We decided again to continue on a straight course. Receiving signs from Bobby that he was ready, off we went with renewed vigour and optimism until dark when we found an excellent drift at the base of a clump of small pinnacles and dug ourselves in for the night.

“We had our igloo completed in record time and the three of us were in high spirits for we were now supremely confident that it was merely a matter of time when we would be safely back at our base. After we were comfortably installed inside the igloo, I made a routine check of our equipment and missed the familiar bulk of our life-raft and concluded that Bobby had forgotten to bring it in. At the apparently simple request to bring it in he appeared fidgety and confused and questioning him still further I elicited the fact that he had deliberately left it behind by the lead in order that he could carry its weight in walrus flesh. In his primitive mind, this reasoning was perfectly sound provided that there were no more leads to cross, but looking to the future I was convinced that as we neared shore the leads if anything would become more numerous, as is, however we at least had an adequate supply of meat and it was no use crying over spilt milk.

“During that night, I was awakened by loud noises which sounded like thunder-claps and loud cracks and concluded that they resulted from the impact of two floes colliding under tremendous pressure. A few nights back we would have been filled with considerable apprehension but our morale was now so greatly improved that we were now only mildly interested: but just the same it was a terrifying thought to visualize ourselves engulfed in a similar cataclysm when fast asleep in our igloo and dispatched to kingdom-come without ever

awaking, and this thought only made us still more determined to get off the ice-floes as quickly as it was humanly possible.

"Next day we breakfasted on frozen walrus squares, biscuit, and chocolate and two cups of tea each, and feeling like normal men again we set out on our way. The day was overcast, not quite so cold, and the wind had veered to the east with a light snow falling. The visibility was not as good as the day before and the mountains were just visible.

"We had only gone a short distance when we sighted huge, fresh tracks in the snow, unmistakably polar-bear which were right across our course and almost at right-angles to it. We were so keen on getting off the floes that we had no enthusiasm for tracking him and in any event we had an ample supply of fresh meat for the time being. We were fortunate that he had not discovered our igloo for if he had he could have crashed into it with one blow of a huge paw perhaps before we could have grasped the rifle and perhaps while we were still fast asleep. This was still another potential danger which had not occurred to us and another reason for reaching shore as soon as possible. His tracks were, however, a definite indication that we must be in the vicinity of seal and, from now on, we should have little worry about food.

"The rest of that day passed uneventfully and we were fortunate in finding a good drift before the light gave out and passed the night without incident. The next day proved to be similar to the previous one: overcast, windy and [comparatively] mild with poor visibility. The going was good, rough underfoot at times, but with no tall ice to negotiate. At times, we would be walking for several miles on soft, green, sponge ice which felt remarkably like walking on a soft carpet. The coast-line could now be clearly made out and appeared to be just a few miles away, in fact with a bit of luck, I thought that we might make shore without any more sleeps on the ice-floes.

"We had been walking for about two hours when my worst fears were realized and there right ahead of us lay a lead: not a very wide one, it is true, but still a lead which had to be negotiated without a raft. Bobby realized that he had prejudiced our chances of survival by his foolish action and at the very least had prolonged our stay on the ice. It was impossible to determine how far the lead stretched in either direction in order to walk around it, but there was nothing for it but to walk North in the direction of the drift and at least our extra walking would to some extent not be a dead loss by counteracting the drift of the Labrador current.

"After walking for about an hour towards the North we noticed that the ice on the edge of the lead was becoming ragged and cracked as if it would take very little prying to release a pan of it. We decided to release a pan sufficiently large

to support the weight of the three of us and use this pan as a raft to ferry us across to the other side.

"At last we succeeded in separating a fairly nice pan from the main pack and now the big question was, would it support the combined weights of the three of us? We first of all tried it with one. Bobby, who was used to this sort of thing, took a flying leap on to the centre of it and kept it level from the centre while we in turn jumped on. The pan under our combined weights sank into the water for at least three inches and our feet were awash in ice-cold water and became rapidly numb. We crouched down as low as we could to prevent the pan from capsizing and quickly paddled our way across the few feet that barred our way to deliverance.

"When we hit shore Terry, in his hurry to get off, slipped and fell into the water. His immersion had given us some concern but although the water had penetrated his clothing in a few places, generally it had not penetrated sufficiently to cause him any great discomfort thanks to the fact that his clothing was in the main made up of water-proof skins, so he suffered no ill-effects from it. Our feet although numb with cold, were still dry thanks to the seal-skin mukluks!

"One thing in our favour was the considerable improvement in the surface of the ice and the fact that our compass was luminous. Our speed was of necessity slow but at least the exercise kept us warm until we had reached such a state of fatigue that we were obliged to call a halt. We bivouacked in the lee of an ice-ridge and there we remained until dawn drinking tea and sipping brandy. Fortunately, the cold was not intense during that night although the wind was blustery and whistled eerily over the ice and, with our ever-increasing optimism, the hours passed quickly and we were up and on our way again at the first sign of light.

"It was fortunate that we had decided to stop when we did for the surface of the ice suddenly became extremely rough and continued to be so right up to the shore.

"We literally raced on to the shore and up the cliff away from the hateful ice-floes. As soon as we struck shore we fell down on our knees and kissed the rock for there was nothing else, but bare rock and snow. But it was land and any storms from now on would be known factors at least, and the ground was not likely to open up underneath us. Our first thought was to find a drift and build an igloo. We found a wonderful site half-way up the cliff hidden from the floes in a fine deep drift. From now on they were plentiful. That winter there had been an unusually heavy fall of snow and our main problem looked as if it might be contending with the deep snow on our trek over the mountains to the North.

"It was still broad daylight when we had completed the building of our igloo with at least two hours before darkness and the pleasant prospect of a good long rest. There was no great urgency to continue our journey now that we were off the floes. When we were comfortably settled inside our sleeping-bags, drinking tea and eating our rations, we determined as accurately as possible the position of the coast where we now were. With the 'Four Peaks' as our datum-point and taking into consideration the drift of the floes, we decided that we must be approximately 90 miles down the coast from Port Burwell. If that assumption were correct then we should be somewhere between Nachvak and Nanuktok, and therefore by walking north for approximately twenty miles should strike the inlet of Kamaktorvik. If we were farther south than we calculated then, by still walking north we should strike Nachvak where we knew definitely that there was an Eskimo settlement. I was confident in my own mind that we were north of Nachvak but not so confident that I was willing to take a chance and walk south to reach it.

"Eskimos invariably live in close proximity to the coast for their existence is solely dependent on seal, fish, drift-wood and the fruits of the sea. In wintertime they often trek inland and fish for salmon trout through holes in the frozen inland lakes. By adhering fairly close to the coastal regions therefore there would always be the chance that we would come across some Eskimo hunters either proceeding or returning from their hunting or fishing grounds, or at least old komatik tracks which we could follow to their place of origin.

"When we awoke and dug ourselves out of the igloo, the day was already far advanced and the weather was clear and very cold with a strong northwest wind. Are set off for the first time towards the north on the second phase of our adventure. After having covered a few miles overland we realized that this next phase was not going to be any sinecure. The going was infinitely rougher than we had anticipated, with the snow many feet deep and at times up to our waists.

"We now regretted that we had not followed the coast and, looking back, I realize how foolish it was to attempt to scale mountains and negotiate valleys, but the mind plays strange tricks with one's judgement when the body is starved. Our decision had been entirely a psychological one, the reaction of those horrible days and nights spent on the floes which repelled us from the frozen sea and drove us inland.

"Rather than retrace our steps we decided to plod on somehow overland until we came across the first inlet and from then on adhere more rigidly to the coastline. After about ten miles of most arduous walking we decided to call it a day, build an igloo, sleep and draw up another plan of action. We decided after considerable consultation to scale the mountain we were now on and when at its

highest point should obtain a good view of the surrounding country and make it easier to obtain a more accurate fix of our position.

"The next day dawned very cold and clear and the North-Wester had increased in strength and would be in our faces. If I live to be a hundred I shall never forget climbing that mountain in the face of that North-West wind, through deep snow-drifts, over dangerous crags and up a long steep glacier lying in a valley of its own. We had decided that the glacier would be the easiest method of crossing the mountain and proceeded to slide down the side of the gulley to reach it which we did, finishing up at the bottom in a deep snow-drift after which we started the climb up the glacier. The gulley in which it lay was protected from the main force of the wind and the walking, although slippery, was reasonably easy until we arrived at a point almost abreast with the crest of the mountain when we caught the full force of the North-Wester which must have been of full-gale proportions. We were trying to climb up against it as best we could when I lost my balance, slipped and started to roll down the way we had just come.

"Those few first terrible moments will never be forgotten. Rolling over and over, down and down with increasing momentum into eternity when suddenly I pulled up short and found myself buried in a deep drift. Climbing out and looking around I beheld to my astonishment Terry within a few yards of me who had been swept off his feet in exactly the same way but the can of kerosene he had been carrying had been torn from his grasp and lay between two rocks a hundred feet below. If the can were broken and our precious kerosene lost, goodbye to our one and only comfort, hot tea, which was the one thing we looked forward to at the end of each day's labour. Terry was soon down after it and when retrieved he put up his thumb signalling that everything was alright and no damage done.

"Bobby, during all this, had retained his balance and was now in the act of making his way down to help us. We tried to stop him but he was taking the easy way and sliding down at a good rate of knots on his bottom under perfect control and seemed to be thoroughly enjoying it. He had obviously done this before and welcomed the opportunity of doing it again. The Eskimo takes an almost childish delight in executing stunts of this nature for it is the only outlet open to him for working off his love for excitement. When he is out in the water in his [kayak] he loves to thrill the ones on shore by doing a complete roll under the water and up the other side grinning his head off.

"When we had collected ourselves together, we recommenced the ascent of the glacier, but this time determined to leave the glacier before we attempted to breast the crest and take full advantage of any protection that would present itself. We breasted the crest amid drifts and rocks and gulleys filled with snow in

which we sank almost out of sight until complete and utter fatigue made it impossible to continue. We selected a site protected from the wind behind a crag where there was an excellent drift and there we dug ourselves in for the night, completely worn out and resolved henceforth never to attempt the scaling of mountains again and to adhere as rigidly to the coast as we could from now on.

“The next day was overcast with milder temperature and an east wind on our right side. It was not long before we had breasted the crest entirely and there ahead of us we beheld a great plateau, completely wind-swept and level as a billiard-table, with a smooth surface of hard encrusted wind-swept snow. We must have been up very high for the slightest exertion made itself felt and was probably the chief reason why we were so fatigued on the previous day. The frozen sea appeared to be at a great depth beneath us and it appeared as if there were an inlet or indentation in the mountains at the other side of the plateau for there was a definite line of demarcation between the plateau and the next mountain peak ahead.

“When I look back on this incident I recall a most [exhilarating] feeling walking along that plateau, high up in the sky, on a perfectly smooth surface of snow, a feeling so pleasant that it dispelled all recollection of the hardships we had undergone during the past few days to the extent that we were actually beginning to enjoy the adventure for the first time.

“We had been walking thus for about two hours when we decided to call a halt, rest awhile and partake of a slight repast of raw walrus and snow. We rested for about a half-hour then continued our pleasant stroll along the plateau until we reached the other extremity when, lo and behold, there lay beneath us a long wide inlet stretching out of sight into the mountains from the sea. From where we stood this inlet appeared to be as smooth as the surface of our plateau and if so our progress from now on would be faster and easier. However, to reach this inlet there was a steep mountain side to descend which we decided to negotiate by at least two easy stages.

“It was impossible to find a route where there was any possibility of walking. All we could do was to jump from crag to crag, gingerly wade through deep drifts not knowing if we were about to be engulfed in one and wind our way in such fashion by a zig-zag route in order to circumvent the steep chasms with which the mountain-side abounded. When it appeared as if we had negotiated the half-way mark we called a halt by a huge snow-drift in which we dug ourselves a veritable palace of an igloo with little effort and there we remained until the following dawn.

“We consulted our maps in the igloo that night and it was clear that the inlet beneath us must be Kamaktorvik and, if it were indeed so, we should after

crossing to the other side reach Eclipse Harbour which was approximately 25 or 30 miles away where we knew definitely there was a large Eskimo settlement.

"The next day was cold and clear with our old friend the North-Wester back with us again and in our faces, but this time we were going down the mountain instead of up and our spirits were high. The second half of the descent was remarkably easy to negotiate by comparison with the first, although at first it was necessary to zig-zag. Eventually we set foot on the inlet.

"The surface of the inlet was as smooth and level as it had appeared from on top of the plateau. It was paved with a hard crust of wind-swept snow, slightly corrugated by the action of the wind and on which the largest aircraft could have landed and taken off either on wheels or skiffs in almost any direction. I judged the inlet to be about two miles across from where we stood and with the excellent walking conditions we should reach Eclipse Harbour in about one or two sleeps at the most.

"We set off in line abreast across the inlet with Bobby on the left, Terry in the centre, and I on the right, and had been walking for about an hour when Bobby let out a most terrific yell. Startled, we dashed to his side. His one keen eye had picked out the familiar tracks of komatik runners of fairly recent vintage, for they were not as yet filled in by the action of the wind, and which obviously ran from one side of the inlet to the other. When we ran to Bobby's side to study this fresh phenomenon, Terry turned to me and held out his hand remarking simply 'I guess we're saved.' I shook hands with him and answered 'We certainly are.' An extraordinary ritual to take place in such a god-forsaken place.

"There was no way of determining in which direction the komatik had passed but in any event it was obvious that the settlement from which it came must be on the coast and therefore all we had to do now was to follow the tracks towards the coast and on towards Eclipse Harbour where I was now confident the tracks had their origin.

"We set off this time in single file down the centre of the tracks, Bobby taking up the rear, Terry in the centre and I ahead, and continued in this fashion walking in absolute silence for at least two hours, each one lost in his thoughts, when out of the deathly silence I was startled out of my wits by a most deafening yapping of dogs and jumping around I beheld behind me, almost at my heels, a dog-team and komatik and three Eskimos: a man, a woman and a little Eskimo boy. Bobby and Terry had been picked up a few minutes before and I, in sublime ignorance, was still plodding on oblivious to our sudden good fortune.

"Bobby was almost hysterical, jabbering away at top speed in his own particular dialect to the other Eskimos, explaining to our new-found friends

exactly what had happened to us. It transpired that as we surmised they were from Eclipse Harbour and, according to their speed of travel, were two sleeps away but it could be made in one sleep with a little extra effort. They had been on a fishing expedition to an inland lake and were now returning home. They had spotted us early that morning, shortly after dawn almost as soon as we had set foot on the inlet. They thought at first we must be caribou for it seemed impossible for human beings to be in such a place without dogs or komatik. After a short time they realized we were truly human beings and from then on, and particularly when the dogs caught the scent, nothing could stop them until they eventually caught up with us. If we had only glanced around once during that day all our troubles would have been over but our minds had become one-track and almost hypnotized on the one important fact that we must continue on our course come what may until our objective had been attained. As it was it took them the greater part of that day to catch us. It was a stroke of luck that they had chosen an inland lake from which they had a panorama of the entire inlet and out of which three objects walking stood out like the Sphinx in the Sahara.

"The tracks we had discovered had of course been made by them on their outward trip. After the excitement had abated somewhat, they invited us over to their komatik and hauled out some beautiful salmon-trout and proceeded to hack off some splinters of it with a small axe. The fish of course was frozen as still as a board and the splinters they handed to us were exactly like splinters of wood, but we started chewing them all the same and, as they melted in our mouths, seldom had anything tasted so good. We were still parched for a drink of fresh water and we so informed them, whereupon they excitedly informed us that they knew of a fine lake almost on our route and not far inland where all that one had to do was to scrape away the snow at a certain spot and fresh water would appear underneath. This we could scarcely believe until, reaching the opposite shore, we proceeded inland for about a mile and came across the frozen lake referred to whereupon the Eskimo man knelt down at the edge, scraped away some snow, and there appeared a beautiful spring bubbling furiously underneath.

"I may have unwittingly created the impression through the course of this narrative that Terry and I must have been supermen to have survived these experiences with little or no effect on our minds or bodies, but indeed this was not so. Our bodies had suffered immeasurably through lack of adequate food and also exposure. Although Bobby's face and hands had come through unscathed, Terry's and mine were badly frost-bitten under our beards and by this time most painful and sore. Our muscles however were in fine fettle for we had almost lost any sensation of fatigue.

“Mentally, I for one seemed to be walking in a dream and to this day vividly recall the exultant feeling within me that nothing, absolutely nothing, could possibly stop our progress. Our meeting with the Eskimos I still remember as if it were a vivid dream. I had a strange feeling of [light-headedness] about this period and was daily becoming less communicative, the logical effects I suppose of a starved body on a tired mind. In retrospect, I feel that it was about then we had really reached the limit of our endurance and nature in her own protective way was in the act of making it easier for us to meet death.

“The Eskimos were so pleased at our enjoyment of the fresh water that they suggested we stay there for our sleep together with the fact that many excellent drifts of snow were in that vicinity with which to construct a larger than average igloo to accommodate the six of us. We agreed wholeheartedly and without further ado had soon constructed a suitably large igloo. The Eskimos were travelling in comparative luxury judging by our standards, for they withdrew from their komatik armfuls of twigs and scrub with which they covered the floor of the igloo.

“We divided the pieces of walrus and cooked ours over the primus. Seldom has meat tasted so delicious. The Eskimos on the other hand preferred their meat raw and the aroma of cooking meat held out no attraction for them.

“The Eskimos including the woman were confirmed smokers and except when they were eating never had their pipes out of their mouths. Terry and I had no inclination for tobacco, having been without it for so long, but Bobby hauled out his pipe and accepted a fill from them and smoked it with the greatest relish. It was obviously chewing tobacco in its strongest form, jet black in appearance and so hard it took all the strength of the Eskimos to cut it. After their pipes were pulling satisfactorily we were obliged to reiterate our story over and over again, and after each telling they appeared to become more and more astonished. Eventually we were so overcome by fatigue that we were obliged to excuse ourselves and soon fell into a deep sleep from which we did not awaken until aroused by the Eskimos, who were now ready with dogs harnessed and equipment packed for the final run to their settlement at Eclipse Harbour.

“When we crawled out of the igloo there was a full moon and the night was wonderfully clear. The Eskimos were resolved to reach their destination without any more building of igloos or sleeps and only stopping periodically for short breathers and refreshments. With the greatest relief we were able to rid ourselves of our respective loads and place them on the komatik. It would not be possible for more than two to ride on the komatik at a time, so the Eskimos insisted that Terry and I have the honour of being the first two. After about twenty minutes we jumped off and two others got on and so on. We travelled, walking and trotting for about thirty or forty minutes, and riding for about twenty minutes.

After a short time we had this worked out to mathematical precision using our eight-day clock for timing these intervals accurately, which rather intrigued the Eskimos who relied on their state of fatigue for their rest periods.

“That hectic komatik dash from moonlight to moonlight will forever stay in my memory, for it was moonlight again before we finally reached our destination; the unfortunate dogs took a terrific beating, tired almost beyond endurance with bleeding paws and frothing mouths, but the Eskimos were unconscious of it. To them dogs were merely a means of transportation and are not to be pampered. If they as much as slowed down, an Eskimo would run ahead and hurl a heavy steel fox trap at the delinquents and so, to the tune of alternate yelling from the Eskimos and howling from the dogs, we made our way up the coast.

“It was not possible to adhere religiously to the coast at all times. Occasionally there would be a run inland, half-way up the side of a mountain when all would be obliged to push and shove to reach the top and then there would be the exciting dash down the other side. The Eskimos seemed to have no imagination whatsoever for, although we almost capsized on several occasions, they repeated this manoeuvre on every possible occasion and derived considerable fun and excitement out of it.

“Freed of our loads Terry and I experienced no difficulty in keeping up with the komatik which kept us at a steady trot. Strangely enough we discovered that a steady trot was easier than walking when we became accustomed to it.

“We rested for about an hour, unharnessed the dogs, fed them and then were on our way again. We had soon attained our original pace which darkness did not interrupt, for the Eskimos were on familiar ground and even the dogs knew their way for they sped on hour after hour without hesitation. When the moon again showed itself, we derived from it a sense of real adventure mingled with excitement at the anticipation of meeting people again, for we knew that Eclipse Harbour was one of the largest Eskimo settlements on the coast.

“After travelling for about three hours the Eskimos informed us that our destination which was just around a steep turn at the bottom of the hill. The dogs continued to gallop on ahead without hindrance from the Eskimos while we walked along slowly in the rear.

“As we rounded the turn at the bottom of the hill, we came upon a village of igloos, the extent of which we were unable to judge in the waning moonlight. It appeared as if there were several [parallel] lines of igloos interconnected as if to permit access from one to another. Standing around awaiting the return of the hunters were groups of Eskimo men and women who, when they had heard the cries of the returning dogs, turned out to greet the hunters and inspect the spoils

of the hunt which would be shared among them, unaware that three strangers had been added to their company.

“Bobby was now in his element: he was the lion of the hour, jabbering away at top speed to all and sundry and especially to the women who crowded around him, obviously more interested in him as one of their own kind than in either Terry or me. When it was explained to them exactly who and what we were, they seemed to be immensely interested and regarded us more in the light of oddities than guests. Our appearance may have had a lot to do with this, for we had noticed that they at first had looked at us askance. We did not realize at the time how odd we must have looked for we had no mirror, but when we arrived back at our base and looked into a mirror we actually frightened ourselves. Terry and I were both reduced to skin and bone, my weight was only 126 pounds from an original 146 pounds, and we were both very badly frostbitten about the face and hands. Our faces in particular were very sore and at times quite painful, and were now almost covered with the dark-brown scabs of healing frost-bite.

“After much chattering back and forth in a dialect strange to us, we were eventually introduced to the head-man of the village, who occupied the largest igloo and who appeared to have the largest aggregate of women surrounding him. With Bobby as our interpreter we repeated our story amidst frequent interruptions of astonishment from the head-man and those around him, after which he took us in hand and gave Terry and I each a wooden bunk constructed from drift-wood on which to rest. Bobby had disappeared obviously, quite capable of looking after himself.

“The igloos were not nearly as comfortable on the inside as they had appeared from the outside. The floors were inches deep in water caused by the melting snow as a result of the combined heat from so many bodies in such a confined space. To offset this, they had constructed duck-board tracks from drift-wood and had placed them around the floor. We observed now that the igloos were really inter-connected by low tunnels through which one was obliged to stoop quite low in order to pass. By comparison the small igloos we were now accustomed to on our trek seemed infinitely more comfortable with dry floors on which we could lie with impunity, comfortable yet not too warm in our snug sleeping-bags. On the other hand the large igloo we were now in was comfortless in appearance and uncomfortably hot to the extent that the Eskimos, male and female alike, were beginning to discard their clothing while some were already in a state of complete nudity.

“In this particular igloo which was probably the most palatial one in the village, the Eskimos slept on wooden bunks constructed from drift-wood with skins for covering. Terry and I were each provided with a very wide bunk, after

which we handed out our tea, requesting that they make some for us and then keep the remainder for themselves. They were childishly grateful and quickly one of the women made herself busy preparing what to them was a distinct luxury.

"They employed shallow pans secured from the [Hudson's] Bay Co., filled with blubber fat around the edge of which was placed moss gathered from between the rocks. The moss was partially immersed in the fat and became an effective wick which emitted an excellent flame for light and heat if kept properly trimmed. One of the chief duties of Eskimo women is to prepare and keep trimmed this type of lamp.

"Several of these lamps were burning in this igloo with an Eskimo woman stationed at each one tending it. On our request for tea one of these women produced a can from underneath one of the bunks, filled it with water procured from a barrel of thawing ice, and proceeded to boil the water over her blubber flame. When the water was boiling she threw in a handful of tea and handed the can to us. The resultant brew was a trifle rugged and devoid of milk or sugar but nevertheless most refreshing. After we had drunk our fill we handed the can back to the woman who immediately polished off the tea-leaves, smacking her lips with obvious relish. Cans were apparently at a premium for this same one was used over and over again for successive brews and each one, without fail, having consumed the brew, polished off the leaves before handing the can to the next consumer.

"After this ritual was over, Bobby explained to the head-man that white men preferred cooked fish to raw-fish and proceeded to explain in detail how he had seen fish cooked at our base. The head-man turned to one of the women and relayed these instructions to her whereupon she immediately procured some water in the same can, placed some arctic cod in it, and boiled it over one of the flames. It was one of the most delicious meals Terry and I had ever eaten, so much so that Terry when we had finished turned to me smacking his lips and said 'Ritz-Carlton.' We enjoyed it so much that we asked for more, knowing full well that they were well supplied with fish. Our request for more pleased them immensely and was the best tribute we could have paid them and they continued to supply us with cooked fish until we could eat no more.

"After about an hour the women produced some flour from an obviously slender stock, mixing it with water and cooking it over a flame. The result was a kind of Bannoch [bannock] loaf which when eaten warm isn't too bad but if allowed to become cold sets into a hard, dry paste. We promised them that when we returned to our base we would send back enough flour to last them a long time.

"In our weakened state the meal that we had consumed had the effect of a seven course banquet and we now felt very sleepy and expressed the wish that we might turn in for the night. The Eskimos thereupon scurried around and produced several caribou and polar-bear skins which they handed to us. I remarked to the headman that one of those wide bunks would suffice for both Terry and me but he wouldn't hear of it with some ulterior motive in his mind which ended in his going into solemn conclave with several others. As a result of this conference two very buxom ladies reported to me and two others similarly buxom reported to Terry. When we remonstrated to the head-man about this fresh turn of events he solemnly explained to us that when the lamps went out during the night the igloo became quite cold and we in our weakened state would have difficulty in keeping warm. We were therefore to sleep between two of these ladies who would keep us nice and warm all night long. While this long explanation was taking place the ladies had disrobed completely and were now quite naked, and without further ado, climbed on to the bunks insisting that we lie between them which we did with alacrity to the accompaniment of much bantering and merriment from the delighted Eskimos.

"It is sad to relate that in our weakened state we were unable to take full advantage of this interesting situation in which we found ourselves involved but instead fell unromantically fast asleep.

"I was awakened from a very deep sleep in the middle of the night by one of my women climbing off the bunk on to the floor. One of the blubber lights was still burning and by its dim light I watched her, wondering where she was going and what she was about to do when, to my consternation, she retrieved the one and only can from underneath the bunk and immediately I heard a gentle tinkling sound as of water trickling. It suddenly dawned on me that she was using the can as we might a toilet bowl. I feverishly recalled that that was the very same can out of which I had so recently consumed such delicious tea and boiled cod-fish.

"This incident set me to thinking and I wondered how many months or years this can had been used for that purpose and why I had not detected any peculiar flavour either in the tea or on the fish, yet I particularly remembered that there was absolutely no effort made to wash or rinse it before using. While my mind was musing on this problem, my other lady companion entertained me in a similar manner but she considerably went to the entrance of the igloo and threw the contents outside, after which they both settled down again for the night without the slightest show of embarrassment. I did not get to sleep for quite a long time after this during which several other women relieved themselves in like manner. The complete nonchalance with which these

performances were carried out led me to believe that that was the primary purpose for which the can was intended.

‘Where ignorance is bliss, ‘tis folly to be wise’, and in any event we had thoroughly enjoyed our fish and tea but it was highly improbable that we would enjoy anything from the same can on the morrow. We simply had not realized that we had stepped into an entirely different civilization, one that had not as yet aspired to our modern methods of hygiene and the scouring of pots and pans.

“I eventually got off to sleep again and slept soundly until awakened by the head-man who informed us that it was their main objective to get us to our final destination as quickly as possible with which we heartily agreed. Out came the pan and this time I did not lose sight of it for an instant but it was just as I thought there was not the slightest effort to wash or even rinse it, it was simply dipped into the barrel of water just as it was, and immediately placed on the flame to boil. I suppose in the final analysis, boiling is as good a way as any to sterilize anything and so, with this consoling thought, our breakfast of boiled fish and tea was consumed and enjoyed.

“After we had finished our meal we went outside where we discovered that our hosts had ready a team of seven dogs and a komatik rather larger than the one we had been using the day before, perhaps with an eye on the supplies we had promised them on our arrival back at our base. Our companions on this trip were to be the same two male Eskimos who had found us, the husband having decided to leave behind his wife in order that more space would be available for supplies on the return journey. I questioned them as to the time it would take to reach Port Burwell and they informed me that normally it would take one sleep but that this time they intended to run straight through with only short rests. This suited us admirably for if we had stopped for a sleep we wouldn’t have slept anyway.

“To the accompaniment of numerous farewells and promises to return and visit them with a ‘Tingiook’ (the Eskimo name for an aeroplane), we bid our friends farewell amid much barking and howling by the dogs and loud chattering by the Eskimos. The little Eskimo boys ran ahead apparently quite tireless, urging on the dogs and throwing the inevitable steel trap at the more obstinate ones, and so on we travelled hour after hour taking turns at riding and trotting, until the moonlight had given way to darkness, and darkness to dawn, and then through the short period of daylight, with occasional short stops to rest the dogs and partake of a light refreshment ourselves. Just before darkness set in again we stopped for about an hour to unharness, feed and rest the dogs, then we were off again into another night and into another full moon until about midnight, with the moon still bright, our goal came into sight and in the

distance across a bay we could make out dimly the Hudson's Bay Post and a little farther on the faint outline of the old Moravian Mission building which was our home.

"All was deathly quiet with not a soul astir, for we had long since been given up for lost, and we wondered what the reaction would be like when we put in our appearance like dead men returned from the grave. As we neared the base, the dogs acquired the scent of our own dogs and set up a terrific howling and, although they must have been tired to the point of complete exhaustion, they set off at a terrific pace so that we could not keep up with them. Soon there were answering howls from the other dogs and altogether a veritable bedlam ensued. When we were within hailing distance Bobby produced the rifle and fired our entire stock of 49 rounds into the air. The sound of firing produced an immediate reaction. The doors opened and out rushed everyone in various stages of undress: Frank Coghill, the Officer Commanding (O/C) of the Base, Doctor Kelly, Constable Montague of the R.C.M.P., Louis Paquette who was later lost with Parker Cramer flying the Atlantic, Wilson of the Marconi Co., and Captain Bennet of the S.S. *Canadian Raider* which had been wrecked the previous summer. Out dashed the cook, old Congdon, also Sgts. Kirkcaldy, Semple and Torrie, all in utter amazement at our return from the dead. They completely overwhelmed us with their uncontrolled emotions at again seeing us alive and well. It will forever be an unforgettable moment in my life and one which cannot be adequately expressed in writing. Soon the remainder of the small community arrived, Mr. Ford the Hudson's Bay Manager, Cpl. Nichols the Senior member of the R.C.M.P., and all the Eskimos in the community, all had heard the howling of the dogs and the firing of the rifle and sensed immediately that something most unusual was happening to disturb the usually uncanny stillness of the Arctic night.

"An immediate party was decided upon whereupon we were practically carried into the dwelling and soon were relating our story over and over again and replying to question after question while our friends passed the liquor around. Terry and I with our empty tummies after one large brandy decided to call quits, but the others carried on into the night and during the rest of the next day. Louis Paquette, the official wireless operator, when he had heard sufficient of our story to make sense, dashed up to the transmitter and flashed the news over the air to Wakeham Bay, the Base of the leader of the expedition Squadron Leader (S/L) T.A. Lawrence, and direct to Ottawa.

"Strangely enough Ottawa received the news before Wakeham Bay due to the fact that they were on continuous watch, while Wakeham Bay did not receive it until their next schedule, but on receipt of it they also immediately went on continuous watch and bit by bit obtained the complete story which in

turn they relayed to Ottawa. Soon the story was in the hands of the Canadian Press and was being relayed to newspapers all over the world.

"S/L Lawrence sent us a message that he was preparing to fly down from Wakeham Bay at first light to receive the story at first hand. While the party was at its height, Doctor Kelly retrieved Terry and I and put us to bed in his own room where we should be safe from interruption, and although the sound of the celebration effectively prevented our sleeping, we at least were resting. It was then that he received our story at first hand so that he would be in a position to diagnose our condition and treat us accordingly.

"We were immediately placed on a liquid and fish diet for at least a week and told that we were to remain in bed for observation. After two days in bed a reaction set in and we found it impossible to get out of bed without help. I well remember trying to get out of bed the first time; I was trying to stand up when my head started spinning and I fell down onto the bed where I remained for the next few days.

"We remained in bed for a week, closely watched by the doctor, who personally supervised every little thing we ate and did until he had made up his mind that we had suffered no permanent ill-effects, [and eventually] he gave us a clean bill of health to get up and do as we pleased. During that week in bed we were obliged to retain our straggly beards owing to the frost-bite scabs and it was almost a month before we could have a proper shave. The brown scars remained for over a year and to this day one side of my face is extremely tender.

"In the meantime S/L Lawrence had arrived and had personally taken charge of the official reports and the transmission of them to Ottawa. To my joy he informed me that he had decided to leave his aeroplane behind with us to replace the one I had lost and to return to Wakeham Bay by dog-team for the experience of the thing, via the southern shores of Ungava Bay, Chimo, Payne Bay and up the south shore of the Straits to his base. With our experiences still fresh in our memory I didn't envy him his trip, but eventually he set out and after weathering out two blizzards in igloos he arrived back at his base in just under ten days.

"Bobby all this while was being feted royally by his own family in their own way, and to do this they were issued with as many supplies of our stores as they wished. The two Eskimos who had brought us back home remained with us several days taking part in the celebrations and when they were ready to return home were issued with as many stores as they could carry on the komatik and were promised still more if they cared to make a second trip. We were indeed sad to see those delightful people leave for to us they had become almost as rescuing angels. When they left, they left us with the impression that we had been doing them a favour all this time and, instead of accepting our thanks

which was offered from the bottom of our hearts, they were most profuse in extending theirs for the few supplies we had given them. This so-called civilization of ours could well profit by their example of sheer honesty, humility and simplicity.

“The ambition of both Terry and I was to take an aeroplane over the entire route again to discover the exact spot where we had forced-landed, therefore three weeks later we were up in the air again and across the Straits to Resolution Island, up Frobisher Bay for about the same distance as before, and then back across Grinnel Glacier to the Straits on course for Burwell. On this particular occasion the weather conditions were perfect, extremely cold but with unlimited visibility in every direction; when we were halfway across the Straits we flew out into the Atlantic for about sixty miles and then South parallel to the Labrador hoping to catch a glimpse of our aeroplane but with no luck. We flew down to Eclipse Harbour and flew over the Eskimo village at which we were guests, and would have landed had it not been for the fact that our fuel was running low and we were not quite sure of the landing conditions of the ice in that vicinity.”



Figure 3-10: Fokker G-CAFU equipped with skis preparing for departure. Source: Hudson Strait Expedition/ Military Communications and Electronics Museum

Chapter 4

COMMERCIAL AVIATION IN NORTHERN CANADA

Although the above title indicates little or nothing in connection with the activities of the RCAF, many of the individuals who played important roles in the development of northern commercial air lines are ex-members of the RCAF whose first taste of northern flying was savoured whilst in the employ of the service. In any case, so great a [contribution] was made to the development of northern Canada by the “bush pilot” and northern airline operator that it is fitting that mention be made of it here.

The development of the east-west Canada of to-day has largely been the result of continued expansion of surface transport in the form of rail, road and river units. This transformation has largely taken place in a narrow industrial and agricultural belt extending from the Atlantic to the Pacific to a depth of a few hundred miles north of the international border.

To-day there is a new north-south Canada rapidly emerging as the aeroplane, the latest and most revolutionary vehicle in the history of transportation, expands the concept of Canada to the far reaches of the Arctic Ocean and ultimately projects it into an integrated global air structure. Perhaps the most succinct summarization which has been made of Canada’s northern destiny is embodied in the following paragraph from *Canada Moves North* by Richard Finnie, in which this noted student of Arctic conditions stated: “Canada moves north. Canada must move north. Mining and industrial development will creep over the Circle and onward to the shores of the Arctic Ocean. Soon with freight, and passenger planes sweeping back and forth over the Polar Basin between Europe, Asia and North America, the Arctic Islands will become way stations.”

The realization of this prophecy will be dependent, in a large measure, on the role played by the aeroplane. Already it is admitted that the greatest single factor in the large-scale development of Canada’s far northern regions has been the air carrier. In fact, flying freight services had their inception along Canada’s northern air routes, and at the outbreak of World War II the Dominion’s flyers carried the world’s record tonnage of commercial air cargo. The history of this development goes back to 1920, when the rather insignificant total of 6,740 pounds was carried, and moves forward progressively to 1937 when the record

volume of 24 million pounds was carried by air. Even in 1939 the air freighters of Canada moved 19 million pounds which compares with 9-½ million pounds carried in the United States during the same year. Northern air services also indicate that in Canada, unlike most countries, air routes were started originally from railhead northward to outlying regions rather than paralleling existing surface routes between heavy interurban population centres. The present air routes in Northern Canada are essentially complementary to both the transcontinental airline and to the great east-west railway systems.

Air freight services to northern points commenced on a major scale in 1926 in the Red Lake District of Northern Ontario and extended to the point where, in 1928, commercial aviation in Canada was rapidly expanding throughout the broad expanse of the North, and several companies were extending bush flying activities from coast to coast. In that year, C.H. "Punch" Dickens, now Sales Director of De [Havilland] Aircraft of Canada and recently Vice-President and General Manager of Canadian Pacific Air Lines, piloted the first plane over the "Barren Lands" of Canada's Northwest Territories. In the following year he crossed the Arctic Circle and brought his Fokker monoplane down at Aklavik. This trip to the shores of the Arctic Ocean revolutionized the fur delivery system, and almost overnight the aeroplane became the transport medium greatly augmenting the dog sled and canoe of former years.

Other intrepid flyers followed a like course in opening up many new routes. In 1930 what is now the British Commonwealth's greatest source of radium and uranium, second only in the world to the [Belgian] Congo deposit, was discovered in the far north at Great Bear Lake by plane. The aeroplane also played a prominent role in locating the richest mercury deposit in the British Empire in northern British Columbia. It is also significant that as early as 1931 the possibilities of Northern Canada with relation to global air routes were given world attention by the Lindbergh flights across the north to the Orient. In 1931-32 the aeroplane developed many new northern mining fields, and, by 1933, while flying was still not fully accepted in the more populated southern districts of Canada, the aeroplane had become a commonplace factor in the northern regions of the Dominion.

As early as 1915 Dr. Charles Camsell, the recent Deputy Minister of Mines and Resources (now retired) made enquiries about obtaining flying boats for the exploration of the Sub-Arctic. In 1918 the world, famous Arctic explorer Vilhjalmur [Stefansson] wrote to Sir Robert Borden urging the government to institute an official survey of transpolar air routes, and one of the staunchest supporters of this proposal was J.A. Wilson, Director of Air Services and Civil Aviation for many years, prominently associated with the growth of air services throughout the entire history of commercial aviation.

Even in 1922 the Canadian Government recognized the fact that the shortest routes between North America and Europe and Asia all pass through Northern Canada, and the authorities at that time had a survey made of the islands of the Eastern Arctic to determine the possibility of air operations in that vicinity. This study by Squadron Leader R.A. Logan however, did not receive full governmental support, as certain key officials considered transpolar flying as being somewhat fantastic.

Meanwhile resourceful and energetic pilots and small operators carried on their experimental work against great climatic and financial difficulties to lay the groundwork for the present extensive air network. Back of the recent sensational air expansion in Canada's Northland lie more than twenty-five years of development, and it is admitted that without the experience of bush flyers and commercial air companies many of the present northern vital routes, together with valuable background operating data, would not presently exist.

Perhaps the most outstanding company engaged in northern aerial work was Canadian Airways, which, founded in 1930 by the late James A. Richardson of Winnipeg—one of the greatest contributors to the development of civil aviation, provided air services throughout many regions of Canada. It secured the first airmail contract in Canada and also pioneered the daylight and night flights on the prairie section of the trans-continental air route. It was well known throughout the Dominion particularly in the northern areas, and in the fifteen-year period between 1927-1941 carried the record total of 80 million pounds of air cargo, 8 million pounds of airmail, and 250,000 passengers.

Then there is the story of Yukon Southern Air Transport. This company operated northward from Vancouver and Edmonton to Whitehorse and Dawson and was founded by Grant McConachie, well known northern air pioneer, who accepted the challenge of this vast northern wilderness. After charter flights were made in 1934-35, a schedule mail service was commenced in the latter year between Fort St. John and Fort Nelson, and mail and passenger service between Edmonton and Whitehorse was inaugurated November 5th, 1937, and the run was shortly extended to Dawson.

In 1936, Sir James McBrien flew overland from the Yukon across British Columbia and wrote in his diary that "Undoubtedly this route will be flown frequently in the future as it is one of the great routes from the United States and Canada to the Far East".

The line progressively grew in size and equipment until, at the outbreak of World War II, it was the most important factor in the northern air transport picture. Pioneer work done by this company in laying down landing strips and airfields assisted materially in locating the joint defence airfields and the Alaska Highway.



Map 4-1: Sir James MacBrien's Inspection Flight, 1936. Source: DHH 73/1324.

These two companies, along with other operating units, were later integrated with Canadian Pacific Air Lines. While the Canadian Pacific Railway Company secured a charter from the Dominion Government in March 1919, giving it the right to own and operate aircraft within and without Canada, it was not until 1930 that the Company made an investment in Canadian Airways, then the nation's largest privately owned air carrier.

In 1939 the Canadian Pacific undertook a survey of the nation's privately owned air companies, and as a result of the findings, further expanded its holdings in Canadian Airways and Yukon Southern, while interest was acquired in eight other smaller lines operating local services in various parts of the Dominion. In certain areas these companies operated duplicate and triplicate routes, but, the Canadian Pacific exercising managerial control, made plans to eliminate uneconomic and wasteful duplication, improve and standardize equipment, and place northern airlines on a sound financial and operating basis to provide maximum service to the public and presently to render invaluable aid in connection with the war effort.

The formation of the Canadian Pacific Air Lines (CPA) took place early in 1942 and the company operated approximately 80 planes, had 1,300 transport employees, and 12,000 miles of north-south scheduled routes. During its second year of operation in 1943 CPA carried 9.5 million pounds of air cargo, 72,000 passengers and 2,200,000 pounds of airmail and flew 6.1 million revenue plane miles.

In addition to the vital service which CPA rendered the nation's war effort with regard to the movement of essential cargo and personnel along northern defence routes, the company was the largest single civilian organization connected with the British Commonwealth Air Training Plan and operated, on a non-profit basis, six Air Observer Schools. It also managed five engine-overhaul and aircraft repair plants under contract to the Department of Munitions and Supply for the overhaul and repair of RCAF equipment. To perform these vital tasks the company employed over 9,200 employees in its transport operations, air-training schools, and aircraft overhaul plants.

As a result of the formation of CPA through the integration of practically all the pioneer northern air companies in Canada, the company acquired the services of many of Canada's leading flyers. Its staff officers included such well known Canadian air personnel as C.H. Dickens, G.W.G. McConachie, W.R. "Wop" May, C.R. Troup, G.A. Thompson, W. Wollet, Air Commodore Herbert Hollick-Kenyon, Ted Field, Walter Gilbert; and a number of others who were either associated with CPA in its war transport operations or held administrative or operating positions with its affiliated air training [schools] and overhaul plants. The background knowledge possessed by these men is of inestimable value in the development of Canadian Aviation to-day and particularly the further expansion of air facilities and general progress throughout the North.

It is a fact that the development of a vast airfield network has considerably altered the technique of northern flying. The single engine bush planes of fifteen years ago, geared as they were to skis or floats have largely disappeared except to off line points.

In the old days approximately three months of the year were lost in actual flying time due to freeze-up and break-up periods. To-day multi-engine high speed aircraft on wheels and flying on regular airline procedure provide an all-year service.

Airfields, the equal of those to be found in the great cities of Canada and the United States, are spotted throughout the broad expanse of the north. Navigational and weather facilities of the latest design are at the disposal of the military and commercial flyers. The extensive civilian ground facilities provided

by Canada's air services branch of the Department of Transport are most important in connection with modern global flying over the northern areas.

Northern or sub-Arctic Canada is not at the top of the world as much as it is in the middle of the world in an air sense. On the basis of the Azimuthal projection practically all the great circle routes between North America and Europe and Asia cross the Polar regions. Canada thus holds the key to future global routes.

The total area of the Northwest Territories and the Yukon amounts to slightly more than 1,500,000 square miles, or approximately two-fifths of the total area of the Dominion. The extent to which population and industrial development will be expanded depends largely on national policies and the degree to which immigration and trade expansion takes place in these regions and the Yukon. It is expected that mineral and natural resources development will take place in the North as part of a national reconstruction plan which will create new opportunities for air freighting work. It is equally true that there should be a fairly considerable tourist traffic development in these northern regions particularly with relation to big game hunting and fishing. The North Pacific area of this continent would seem to be one of the areas particularly suitable for the development of tourist air traffic due to unusual [scenic] and hunting possibilities and the fact that [comparatively] large population centres are removed from the north by only a few hours flying time, and the lack of other adequate means of surface transport.

A new chapter in the story of Canadian transportation is being written by the aeroplane in its development of Northern Canada. The northern air routes in existence to-day will undoubtedly be links in a global air chain. In this connection it appears certain that few countries have more to gain than Canada in the vast changes which will materialize.

Chapter 5

ARCTIC OPERATIONS IN WORLD WAR II

Introduction

This chapter is divided in two distinct parts, one dealing with Home War Arctic and Sub-arctic Operations and the other with Overseas Arctic Operations.

The Operations that can be categorized as Arctic and Sub-Arctic were bomber reconnaissance over northern waters off the east and west coast, Atlantic ferry flying, certain operations of Transport Command (e.g. northwest staging route, search and rescue, photography and mapping) and the Aleutian campaign.

Wing Commander Robert Morrow who was the Wing Commander flying of the Canadian Kitty Hawk Wing attached to Aleutian operation has submitted a personal report on this operation. The following is a condensed version of the same.

Aleutian Campaign

In June, 1942, a Japanese Task Force came into the Aleutian area and operated north and south of the Aleutian chain, almost as far in as the mainland. They eventually struck at Dutch Harbour with carrier aircraft and did a great deal of damage. They were counter attacked by fighter and B-26 U.S. Army Aircraft from Umnak Island, which lies about 75 miles west of Dutch Harbour. The total operation lasted three days, at the end of which time the Japanese Task Force withdrew and established permanent bases on Kiska and Attu. Their base on Kiska became quite a strong point and their main operational base in the area. The base at Attu was used more as a [re-enforcement] and staging point for ships from the main Japanese Islands and from Paramushiro, which is the main post in the most northerly Japanese Islands and is about 750 nautical miles from Attu. The Japanese endeavoured to build landing strips on both of their islands, however neither of them was completed at the time they were taken over by the American Forces. Float fighters, which were evidently brought by ship to Attu, assembled there and were flown to Kiska. Very few of them actually got to Kiska as P-38's on [strafing] runs from Amchitka and Adak finished most of them off as soon as they were assembled. One force of [Mitsubishi] bombers came over Attu from

Paramushiro. About 20 came over and about 4 went back. They were intercepted by P-38's from Amchitka.

In June 1942, when the panic was on, the Commanding General, U.S. Pacific Coast asked Western Air Command for aerial support. A wing was formed and dispatched immediately commanded by Wing Commander Gordon McGregor. It included one Bolingbroke Squadron under Wing Commander Charles Willis and one P-40 Squadron under Squadron Leader Deane Nesbitt. They were dispatched to Yakutat[, Alaska], however by the time they got there it was evident that there would be no action in that area for a long time. They were then sent to Anchorage, Alaska. By the time they arrived in Anchorage the whole situation was stabilized and there was no combat activity for many months until after the Americans had completed a line of bases running right on down the islands to Kiska.

There was one incident in 1942 that is perhaps worthy of note. A flight of P-40's was based on Umnak Island for a few months and from there proceeded to Adak, which was at that time the last jumping off point for Kiska. They made one strike at Kiska, during which Flight Lieutenant Ken Boomer shot down a Jap Zero. It was during the movement of the Flight from Anchorage to Umnak that one of our disasters [occurred] when a flight of seven aircraft, lead by Gordon McGregor, was caught out in bad weather and sea fog near Unimak Island and five of the seven crashed into the shore mountains.

Wing Commander Morrow arrived in the area after returning from England in January of 1943 at which time he relieved Gordon McGregor so that the story from 1943 onwards is the part known best. About the time that Wing Commander Morrow went up it was decided to withdraw the Bolingbroke's as it was absolutely impossible to try to operate British Aircraft in an American Zone so far away from Canadian or British supply sources.

Finally another P740 Squadron was brought up to replace them. The two Squadrons were enlarged so that a third flying flight emerged and all were conducted operations with the two P-40 Squadrons and the extra flight. One Squadron was based on Kodiak Island, one on Umnak Island and the operation flight at Amchitka. The main headquarters was retained at Anchorage, Alaska, which was used mainly as a staging and recreational point.

At the time of the attacks on Dutch Harbour, Umnak was the most westerly American base. After the skirmish was over it was decided to push on westward immediately and accordingly American construction troops moved into island after island, occupying and building strips. We were right on their heels and, usually within 48 hours after the first troops went in, the aircraft followed them. The pattern was armed reconnaissance of the island, airstrip construction crews and then full occupation.

The following is a brief description of the terrain and bases.

Anchorage - Operations were conducted here from Elmendorf field, the main U.S. Army Alaskan base. It was exceedingly well provided for with all radio facilities, etc. The base actually held about 25,000 men at the time. Some difficulties were encountered obtaining food particularly light refreshments, as the shipping point from the U.S. is at Seward, on the south side of Kenai Peninsula, and the railroad from Seward to Anchorage is not very modern or efficient. Anchorage lies well up Cook Inlet on a flat plain, which extends inland past the base towards Fairbanks. The mountains are close enough to constitute a flying hazard and the safety height is about 10,000 feet, but there are two good letdown legs for radio work. The weather is a modified version of the Aleutians. No extreme temperatures but windy and a fairly heavy rainfall. All in all, a good spot from the flying point of view, except for the transport difficulty I mentioned above.

Kodiak Island - A large and very mountainous island. It was the main U.S. Naval base for the Alaskan area. Well equipped, etc. Bad weather flying is treacherous, however, here again there is a fair radio approach system, but in poor weather conditions, the field cannot handle a large volume of traffic. One



Figure 5-1: 111 (Fighter) Squadron's Kittyhawks at Kodiak, Alaska. Source: DND Image Library, PMR 80-197.

squadron here was for defensive purposes but never engaged. Actually in 1943, it was used largely for training and was depleted of aircraft and pilots to bolster the operational flight at Amchutka. Sea [communications] with the U.S. were excellent.

Alaskan Peninsula - Extends from the mainland, i.e., north side of Cook Inlet out as far as Cold Bay and the Aleutians were really a piecemeal extension of it. It has a solid mountain backbone with a plain and flat area on the north side. The south coast is all precipitous shore line. To go down the islands from Anchorage the usual route is Cook Inlet to a pass of which the name is forgotten, but it is the same as an active volcano there and in any case is due south of Nak Nek. Through the pass on into Nak Nek which is covered by the radio range. The pass through the mountains here is very rough. Safety height is 17,000 feet with much turbulence and icing, the throat of the pass is usually a hell hole of high winds which seems to collect every line squall in the country. One can fly through contact at less than 1,000 ASL. From Nak Nek on down to the islands is easy - the usual practice is skirting the shore. The only peaks are about 6,000 - 7,000 feet and cloud tops were never remembered as being much over 10,000 feet. This is a noteworthy characteristic of that area. Very bad contact weather but invariably a low cloud top height. This characteristic does not apply on the Alaskan Mainland.

Vegetation on the peninsula is of the slime type as that on the islands. Trees and shrubs are non-existent, and there is only tundra, a few very small bushes and a lot of very heavy, long, coarse grass. The grass was of a type unknown to us, as long as 24 inches and ¼ of an inch wide, always beaten more or less flat.

Islands

The islands are all of volcanic origin and about four of these are active volcanoes. Some of the smaller islands are just barren peaks sticking out of the sea, but the others have sloping shelves at sea level varying in size up to that at Umnak, where there is an area about 30 miles long by 10 wide.

Unimak - Location of Dutch Harbour. Very rough all over. Squeezing in the aerodromes was difficult and the flying quite ticklish. There is no good instrument approach.

Umnak - 14 Squadron was based here. A very large island 30 miles by 20 miles. Open grassy slopes and plains. An important feature is that the whole island is volcanic ash which is excellent for construction purposes. To make roads or runways, the ash is just dumped down, rolled flat and one has a dry finished surface closely resembling asphalt. The ash can be found anywhere, it being necessary only to cut off about 6 inches of topsoil with bulldozers and



Figure 5-2: Inside RCAF barracks on Umnak Island, Alaska, 1943. Source: DND Image Library, PMR 79-538.

there it is many feet deep and absolutely unadulterated with rocks or anything else.

A good weather feature at Umnak is that when either the Pacific or the Bering Sea side is closed in, the other is open. With fields on both sides you can nearly always get in somewhere. There is plenty of game on the island, as there is on most of them. Caribou, fox and rabbit and on the Alaskan peninsula bear and moose. The fishing is also good. The natives lived on it pretty well and every year there is a very heavy salmon run up the streams. Seal are plentiful of course and the Priblof Islands (about 100 miles North of the chain) are thought to be the world's greatest sealing grounds. The rare sea otter is here too, though mainly at Amchitka, which is 75 miles East of Kiska (one of the Rat Islands on the map). I am an expert on them as I could almost have walked ashore on their heads from a dinghy (K-type that is). Incidentally, the U.S. were really tough about hunting which was probably a Good Thing. The troops tried very hard to get hunting privileges but the answer was a flat NO, unless they complied with peace time rules - \$100 for a license and a guide at \$25 a day. There wasn't much official hunting as a result. We had a bit of trouble with animals chewing up wires. The complete lack of wood made it impossible to do otherwise than lay all wiring on the ground.

Getting around on the islands was very difficult. They are all hilly with the exception of the odd flat spot as I have indicated, and trucks chewed up the soil badly. That, with the ever present rain, used to create quite a mess. A command car wasn't too bad on the tundra, but soft spots would bog down jeeps.

Adak - This is the next important island after Umnak. Umnak is about 800 miles from Anchorage, Alaska and Adak is about 300 from Umnak. This became the main army and navy base for the Kiska and Attu operations. Very high hills surrounding the field make it difficult to fly into. The only good instrument approach is a letdown out to sea to contact and then in at wave top height. There is a good harbour inside projecting arms.

The subsoil here is mostly sand. The island has a water shortage because it is so precipitous. Nearly a year after it was first occupied there wasn't one shower bath on the island.

Strikes from Adak were made to Kiska and Attu as a daily feature with B-24's, B-25's, P-38's and navy types. The P-38's found they got better range by cruising on one engine which always seemed strange. Fierce little storms prevail along the length of the islands but the worst locality for such storms is Adak. Sometimes three or four times a day, small, fast moving fronts move across. They appear to move from west to east, that is from the northern Jap islands around Paramushiro to the Alaskan Mainland, skirting the north of the Pacific "High" that lies off Southern Alaska most of the year.

Before continuing further it would be well to explain that one can go anywhere on the islands and most of the mainland without being more than 250 miles from a field.

Adak is about 250 miles from Amchitka which was one of the main jumping off places, but only a forward outpost. There are several islands in between them, only one of which I recall was big enough for a strip - Ugliuga (Ugly Ugly of course). It is just an oval pancake that storms washed right over and only 2,500 feet wide at the widest point.

Amchitka - This island is long and narrow in shape. About 20-miles long and 1 mile wide. The Japs used float zeros to strafe and bomb a bit on the move in, but nothing very serious happened. The subsoil is gravel and made fine roads and strips. We operated from a 2,000ft [air]strip that backed on a hill, making it strictly a one way affair most of the time. The runway was formed by damming off a sea bay with a dike and dumping a strip of gravel in where the bay had been. On higher ground a bigger field was built of metal for B-25's, etc. It wasn't in use long before the Japs packed up. We lived here in rude huts on C rations and generally were pretty miserable. As I remember it was cold, raining

and windy all year round. The climate is similar to southern coastal Alaska, except that it is always appreciably colder.

We ran off dive bombing and [strafing] runs from here to Kiska and the 38's went to Attu. There really was a lot of flak as the area to be covered was small. Mostly light and medium, though there was some heavy. The Japs claimed a lot of kills in their reports but there weren't many aeroplanes lost. Some days there would be perhaps 200 sorties made and the losses would only be about 1 aeroplane in a week or ten days. The only American that ever went down on Kiska was evidently killed trying to get into the half finished strip there and was buried with a fancy little headstone "To the Gallant American who gave his life for his country in honourable battle".

It was off Amchitka that I made my historic leap and swim home so I can tell you about the water there in one short word - COLD! I went in in May and lasted 45 minutes in a dinghy but I was practically unconscious when the Yanks picked me out of the surf. A B-25 crew were dead in an hour a week before that after ditching. I don't think that at any time of the year a man would last in the Bering more than 1-½ hours without an exposure suit of some kind. The temperature is always well down on the scale. It was about 34°F [1.1°C] for my impromptu bath.

Kiska - The island is smallish, with an active volcano and generally covered with hills. I believe there are only two places where there is anything resembling a beach. Kiska incidentally is a long way west as it is the other side of the time zone from North America.

General Terrain Features

The important points to note are - complete lack of trees or even bushes on all islands - the whole area is volcanic - all islands are really mountain peaks. Game is plentiful on the larger islands and the fishing is excellent. A great deal of commercial fishing is done in the area as well as sealing. Good gravel and ash for road construction can be found anywhere.

Weather - No extremes of heat or cold, but generally unpleasant. Characterized by extremely high winds, fog and rain. Sometimes fog will clamp in an island for many days without any break. On wind velocities I can quote 115 m.p.h. (185km/h) plus. I say plus because the [anemometer] blew off at the 115 figure and that is at sea level. We had to do more than picket the aeroplanes at times. We put the wheels in a ditch and the Alaskan civilian boys had another stunt. They tied a piece of 2 by 4 on the wing to spoil lift.

Wood Shortage - This is worth a special note. When there just aren't any trees, life gets quite complicated. I'll leave most of the reasons to your imagi-



Figure 5-3: Advanced Fighter Base RCAF in the Aleutian Islands, 22 September 1943. Source: DND photo PL13162.

nation but it is a nuisance to have to depend completely on what is hauled in. The item I mentioned of animals chewing wires is just one of the unexpected things that happen.

Operations - On all islands routine defensive routine patrols were maintained. Also a considerable amount of anti-ship [reconnaissance], but the U.S. Navy handled most of that. A few B-24 raids were made to the Northern Jap Islands but these were sporadic and didn't accomplish much.

We were concerned mainly with Kiska and Attu - the usual routine - weather trips - dive bombing - low level strafing, etc. Doubtless it didn't keep Hirohito awake at nights worrying, but it must have made life very unpleasant for his faithful boys that were on the receiving end.

The Attu operation was carried out by a task force consisting of battle wagons, destroyers, carriers, landing craft and transports. The Army ran in air support from Adak and Kiska as well. Apart from the local operation, which is not my place to describe as I was not there, the only show of real interest was the one day that the Japs tried a bomber attack on the ships. The Army was running a continuous patrol of P-38's and for early raid warning flew a Catalina on long range reconnaissance. The Catalina picked up a force on its radar, that was proceeding from Paramushiro and relayed the information by radio to the P-38's under a Colonel James R. Watt, one of the nicest chaps up there. Attu was overcast so Watt went on top but unfortunately lost most of his flight in the climb up. I think there were 20 Japs and I know they were intercepted, still without any ground control, by four P-38's. Most of the Japs were shot down

and most unfortunately Watt failed to return. He was last heard on the radio well on his way to Japan with one engine on fire.

Air Transport

This was our big headache. We had no transport aircraft and relied on the U.S. Army. AVM Stevenson did his best by sending up aircraft when we were desperate but it was often too little and too late. Certainly any RCAF force should have its own transport to use, abuse and control.

Moving short range fighters about was a problem. No aircraft were lost on any moves so I think we did it quite well. A transport aircraft was brought along to carry service crews and to run messages. Sometimes it was sent ahead to spot weather. The key to success was never to take a chance on weather with a formation. I always flew contact if possible but-sometimes went over bits of overcast. This was chancy, as our only radio aid was a range receiver that they sell in Macy's for \$1.99. A most necessary ability in flying in Alaska is to be able to pin point on a crude map. The whole trick was to localize yourself by estimation from outstanding features of the topography. There are no roads or railroads and river plotting is unreliable. We found that estimating position from mountain groups etc. was best. I always did believe in flying high, but in mountain country it is a must. Any accidents that happened were invariably caused by people probing around at close to minimum altitudes. In bad weather contact flying, I found that Indian file¹ was a good procedure. It was the [unwieldy] groups of three that partially caused the death of five referred to above and on one or two occasions it might have happened again, had we not been all line astern so that a tight turn was possible. Certainly in a mountain pass, a massed formation is dangerous.

Battle of the Atlantic

Although the battle of the Atlantic was not fought entirely in Arctic waters a good proportion of it was and certainly stations such as Gander, Newfoundland and Goose Bay in Labrador come within the boundary of the Sub-Arctic.

Both these stations were key links in the overseas chain and were it not for them the tremendous volume of aircraft ferried and wounded transported could never have been achieved.

It was from such stations that the war against the submarines was waged by means of the bomber reconnaissance aircraft which were at first Bolingbrokes and Douglas Digbys, but later were Hudsons, Venturas, Liberators and Cansos.

¹ *Editor's note:* single file.



Figure 5-4: Liberator aircraft used for Coastal Reconnaissance and later for transatlantic convoy duty

The highlight of progress in the convoy escort and Arctic submarine war was the introduction of the Very Long-Range Liberator. Until this type of four-engined, long distance aircraft was available, the range of our operational aircraft restricted the extent of our anti-submarine efforts. The new aircraft, however cancelled this restriction and made Trans-Atlantic diversion possible and with the advent of such diversion came the freedom of operations that were not dependent upon base weather in any particular area.

In other words Canada's Home War Establishment was no longer confined to its own "front yard". Shepherding a convoy to mid-Atlantic, passing responsibility over to an aircraft from Britain and then flying on to a British base was not an uncommon occurrence.

At last the U-boat menace was overcome first by holding them under the surface then by swooping them from the seas.

North Atlantic Ferry Routes

Following the passage of the Lend Lease Act in March 1941, the Americans began to deliver aircraft to Dorval Airport for ferrying to the U.K. This operation was carried out by the RAF Ferry Command supplemented by personnel of the RCAF and civilian pilots. The route was from Dorval, to Gander, Newfoundland, to Prestwick in Scotland.

The 2,100-mile [3380 km] non-stop route from Gander, Newfoundland, directly across the Atlantic to Prestwick, Scotland, then used for ferrying by the British and Canadians, was considered by the Americans to have serious shortcomings. A great circle route farther to the North via Labrador, Greenland,

and Iceland, was believed to enjoy better weather, and would make possible the ferrying of fighter type aircraft.

The advantages of being able to ferry short range planes to England were manifest. Pressure on shipping would be relieved. The planes would no longer be liable to loss by submarine action; there would be no need to disassemble and crate them at the factories and reassemble them in England. They could be delivered and be in combat in a matter of days when, otherwise, their transfer and reassembly would take months. Large reassembly depots in England would become unnecessary.

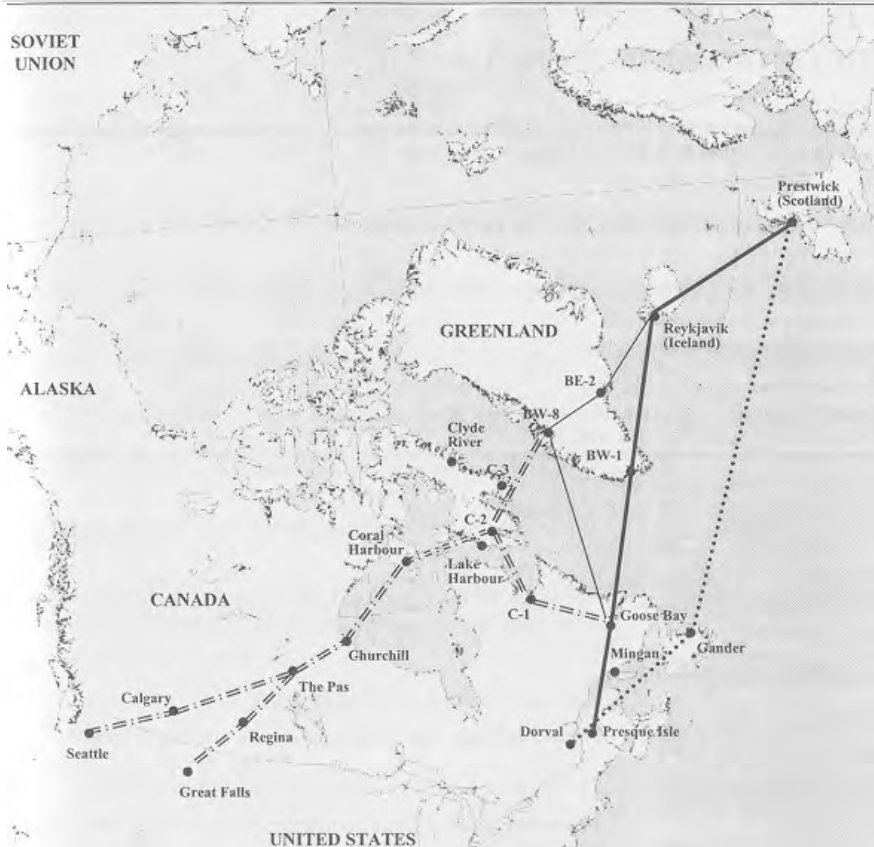
The weather along the great circle route was better than that along the direct route; much better, for instance, in Labrador than in Newfoundland. Fog, icing, and turbulence, the great hazards to flight over the North Atlantic, were less; and with proper weather and communications service and effective radio navigational aids, it was a route which could be made safe for heavy air traffic. The RAF already controlled the airfields in Iceland; there were good terminal facilities at Prestwick, Scotland and, as an alternate to Prestwick, a landing field at Stornoway in the Hebrides. Canada was planning for a base in Labrador. The great problem was Greenland.

The Danish-American Agreement of April 1941 for the common defence of Greenland and the North American continent made it possible for the United States to begin to build air bases in Greenland. Surveys of the Greenland area were ordered at once by the Army Air Forces. No site for an airfield could be found on the east coast, but the survey parties found two good sites elsewhere on the island. The first, given the code name of Blue West 1 (BW-1), was at Narsarsuak, near the southern tip of the island, about thirty-five statute miles northeast of Julianhaab. The second, named Blue West 8 (BW-8), was at Sondrestromfjord, near Holsteinborg, on the northwest coast.

In July 1941, the United States sent its first troops to Greenland and Iceland, and the Canadians discovered an excellent site for an airfield in Labrador at Goose Bay, on Northwest River. With appropriate fields in northeastern United States, the elements of the route were in hand.

Work on a landing field at BW-1 had begun in early July 1941. In September, the Greenland and Iceland base commands were established. Construction began at BW-8; the Canadians began building the airfield at Goose Bay; and, closely tied in with the building of the landing fields, the Army Air Forces ordered weather and communication detachments to points in Labrador, Baffin Island, and Greenland. The stations in Labrador and Baffin Island, three in number and known as the Crystal stations, were admirably situated for the observation of Arctic weather movements that swept over the route. Crystal I was at Fort Chimo, in northeastern Quebec; Crystal II was at

Map 5-1: Air routes in the Eastern Arctic during the Second World War. Source: Government of Canada.



the upper end of Frobisher Bay in southern Baffin Island; Crystal III, on Padloping Island, was just off the northeast coast of Baffin Island. The other Air Force detachments were sent to BW-1, BW-8, and Bluie East 2 (BE-2) near Angmagssalik in northeastern Greenland. Described as “the initial action in the establishment of an alternative route for the ferrying of aircraft from the United States to the United Kingdom”.

The route was known as the Bolero ferry route and the first Bolero flight consisting of eighteen B-17's took off from Presque Isle for Goose Bay on June 23, and all arrived safely. They left Goose Bay for BW-1 three days later, but, this time, only half arrived at the destination. Of the remaining nine, six returned to Goose Bay and three made forced landings at various points on the Greenland coast. No one was injured and the crews were soon rescued. This

mishap, which was attributed to the inexperience of the crews, poor forecasting, and inadequate communications, underlined the fact that the route was not yet ready for use.

These difficulties were not easily overcome. In mid-July, before the first movement was completed, six P-38's and two B-17's were forced down on the Greenland ice-cap after losing their bearings during a flight from BW-8 to Reykjavik. No blame could be attached to route operations in the matter and, as in the earlier crashes, there was neither loss of life nor serious injury.

The first Bolero aircraft to be ferried over the route arrived at Prestwick on July 1, 1942. The entire first movement was completed by late July, and full control of the route and of aircraft movements over it passed at that time to the Air Transport Command. Notwithstanding the misfortunes which befell the first movement, the route soon settled down to efficient operation. With experience and additional equipment, the weather and communications services improved markedly; adequate base facilities became the rule; and the tactical crews, with a longer period of training, began to give a better account of themselves. The old confusion was gone. Experienced ATC control officers briefed and dispatched the Bolero planes; ATC command pilots, navigators and radio operators flew in the lead bombers; and safe delivery over the route of Eighth Air Force planes became a routine matter.

In addition to the Bolero route another, by way of the Pas, Churchill, Southampton Island, Frobisher Bay, Greenland and Iceland was established. This was known as the Crimson Route and was put into use for the purpose of handling the large volume of aircraft ferried from the United States Pacific Coast factories. Planes from another great focal point of United States aircraft production in the mid-west states would fly across Ontario and Quebec to Fort Chimo on Ungava Bay at the northernmost tip of Quebec and from there would link up with the other north-east air route at Frobisher.

These two channels were to be in addition to the ferry route already established to the United Kingdom via Goose Bay, Greenland and Iceland.

Another purpose for the speedy construction of the route was to permit forces from interior points to be rushed to the defence of Greenland and Iceland should the occasion arise.

For several reasons the Hudson Bay leg of the northeast route was not used to the extent anticipated and the original plans were never completely implemented. As the submarine menace was mastered there was a parallel improvement in the shipping situation, permitting the transportation of more aircraft by ship. Increased facilities at Goose air base and at Newfoundland airports permitted a greater flow of aircraft through these fields. Amazing technological advances, which increased the flying range and reliability of

aircraft, as well as improved meteorological services, made the route from Goose air base more serviceable for short-range planes. The successful allied landing in North Africa made it possible for aircraft used in the area to be flown over the southern routes thus relieving the pressure on the northern route. As the fortunes of the United Nations rose in the North Atlantic theatre the threat of enemy action against the north-eastern section of the North American continent diminished.

Thus the Crimson Route was never used and eventually the Governments of Canada and the United States came to an agreement whereby the Canadian government assumed complete possession and control of airfields and bases and agreed to pay for all construction of a permanent nature.

Goose Bay Airport

Goose Bay airport, Labrador, was an important link in the North Atlantic ferry chain. Prior to the construction of this aerodrome long-range bombers were flown across the Atlantic via the air-ferry port of Gander, Newfoundland, but this station had already become a bottleneck, and was of no aid in solving the problem of getting fighters and short-range bombers across the ocean. Moreover, the future program of ever-expanding aircraft production on this continent called for far greater facilities than were already available. Following discussions between Canada and the United States, the latter country undertook to investigate the possibility of establishing airfields in Greenland, later extending similar research to Iceland, while Canada agreed to reconnoitre Labrador.

About this same time another matter was demanding attention. The coastline of Labrador was to then very inadequately mapped; large sections of its broken outline being depicted in either vague or definitely incorrect manner. Ship convoys, taking the northern track via Iceland and the southern tip of Greenland, were ever conscious of the possibility of hidden submarine bases near their line of travel, and the threat of surface raiders along this route was, at that time, a none too remote hazard. This latter danger was later strikingly accented by the naval action involving H.M.S. *Hood* and the German battleship *Bismarck* during the summer of 1941.

The Air Force wanted landing fields, the Navy needed charts. Accordingly, on June 1st, 1941, a photographic detachment of the Royal Canadian Air Force took off from Dartmouth, Nova Scotia, Labrador bound, its duties, as laid down, being to complete by air photography the charting of the Labrador coastline. Subsequently a site was selected near Goose Bay for an aerodrome which was ready for use by early December 1941.



Figure 5-5: Site of Goose Bay Airfield, ca. 1942. Source: W.C.Carr, *Checkmate in the North* (Toronto: MacMillan Company of Canada, 1944).

Goose Bay Airport, overlooking Goose Bay, the Terrington Basin and the Hamilton River, enjoys a freedom from bad weather that normally prevails over the east coast during most of the year.

The airport proper, its surface area approximately twelve square miles, is to great depth composed of a [uniformly] coarse sand, insuring ease of construction, perfect natural drainage, and freedom from frost heavage at winter temperatures. Ample room for construction of runways to any required length is available in any desired direction.

Means of Access. - Assured passage for sea-going vessels of twenty-one feet or less draught, the above a restriction imposed by a bar across the eastern end of Goose Bay.

Weather Conditions. - Without doubt the best and clearest in Labrador. Entire freedom from coastal fogs, the latter said never to penetrate beyond The Narrows at Rigolet. It was pointed out, on the other hand, that the precipitation of the interior largely spent itself before reaching sea level at Goose Bay, and also that the presence of the inland sea of Lake Melville itself had a steadying effect, both on extremes of temperatures and also on modification and dispersal of electric storms.

Absence of Natural Obstacles. - The plateau, standing alone as the highest point in the surrounding country for many miles, had assured freedom of approach for aircraft coming in from any direction.

Harbour. - Adequate space and depth of water in Terrington Basin. Good approach to and feasibility of wharf site. Shelter and mooring room for both

aircraft and sea-going vessels. Maximum change of level by tidal action, two feet.

NORTH WEST STAGING ROUTE

In August 1940, a Permanent Joint Board on Defence was formed by Ottawa and Washington to co-ordinate the plans of the U.S. and Canada. One of the first tasks which the joint board was charged with was to investigate the situation concerning transport and communications across Canada's North West from the United States.

At that time the situation was as follows: apart from the Canadian civilian company's operation between Edmonton and Whitehorse, which was admittedly on a small scale, and the equally small American service between Juneau and Fairbanks, heavy transport was possible only by means of steamers running from the west coast of Canada and the United States to the ports on the Alaskan mainland, or in the so-called inner passage from Vancouver to the long tongue of the Alaskan panhandle, from the panhandle port Skagway, by narrow gauge railway to Whitehorse, and thence by river steamer down the Lewes River, and the Yukon River, through Dawson City to Alaska. Both these routes were susceptible to attack by submarine in the event that the Japanese were able to extend their naval influence to the waters of the Eastern Pacific, and so far as the Whitehorse-Dawson City route was concerned it was in any event not open any longer than the five summer months.

In the light of these inescapable facts, the joint board recommended in November 1940 that the plans of the Department of Transport for building an airway between Edmonton and Whitehorse be carried out forthwith as a strategic measure. These plans were fortunately so complete that it was possible to proceed with them in the matter of a few weeks. The Canadian government decided that construction of the airways should be part of its contribution to the defence of the western hemisphere and announced that it would forthwith construct, at its own expense, an airways up to normal Canadian standards.

No time whatever was lost. On February 3, 1941, that is to say, more than 10 months before Pearl Harbor, contractors were given orders to begin construction of airfields at Fort Nelson and Watson Lake - the only two sites where there were no airfields of any kind. At Grande Prairie, Fort St. John, and Whitehorse there were already usable airfields in operation which needed only to be extended and improved. Since Grande Prairie was served by the Northern Alberta Railroad, and since there were provincial roads running into Fort St. John and since further there was a railroad connection between Whitehorse and Skagway, the extension of these three airfields was what experienced airway engineers of the Department of Transport regarded as a routine operation pre-



Figure 5-6: The town of Whitehorse from the airfield

senting no particular difficulty. At Watson Lake and Fort Nelson the picture was very different. Fort Nelson lies 180 airmiles north north-west of Fort St. John. In between lay some of the most rugged country in the Canadian north-west. Northwards from Fort St. John there existed about 60 miles [of] road passable in winter or dry weather, another twenty miles of tractor trail, but beyond that the only usable method of communication was by dog team along the surfaces of frozen rivers. It was considered that this might be used as a trail until about the first week in April. The alternative was to send supplies by an extremely circuitous route, in which everything would have to be carried by rail to Waterways, and thence down the Athabasca, Slave and Mackenzie rivers to Fort Simpson, by steamship. At Fort Simpson it was necessary to move everything into barges and float the barges up the Liard and Ft. Nelson rivers to Ft. Nelson itself. The late departure of ice on Great Slave Lake, over which part of this route had to go, meant that it would not be passable until July, and it was unlikely that more than two trips could be made in any one year. However the evident urgency of the construction problem convinced the engineers that they must use both routes.

On February 9, 1941, a trail breaker and tractor train left the end of steel on the western section of the Northern Alberta Railway (N.A.R.) at Dawson Creek and struck north to battle its way to Fort Nelson. The tractor train consisted of living quarters for the crew, a blacksmith's shop, five sleighs carrying heavy freight, a kitchen car, and a dining car, staff quarters, radio room, bunk houses for 28 men and sleighs carrying fuel oil and spare gear. Out in the vanguard,

expert trail blazers riding first on horses and later with dog team and sled, marked the trail for the heavy bull dozers which followed. They picked a route which has now become part of the Alaska Highway. Behind the trail blazers came the bull dozers, which frequently had to double back and go over the same ground twice in order to make a trail wide enough for the broad sleighs on which the heavy freight was carried. Behind this huge train travelled another train of sleighs and trucks carrying about 600 tons of freight and supplies. This material was taken as far as the Sikanni river crossing, about half way, and cached there to be taken on to Nelson later. Everything proceeded smoothly until the engineers ran into the earliest break up on record in that region.

This caught everyone off guard. There were about 400 tons of freight sitting at the Sikanni River, which could not now be moved over the muskeg, which had become deep and vicious swamp. This problem was surmounted however. Light freight urgently needed at the airport site was picked up by sea-plane from the Sikanni river and flown to Fort Nelson. Other items which were bulkier but equally urgent were floated down the Sikanni River to the Fort Nelson river and so to the airport site.

The rest of the supplies were left at the river crossing to be picked up after the freeze-up in the fall. In the meantime preliminary work on the airport site was pushed ahead and the runways were being laid out. A complete saw-mill was flown to the site and put into operation. Asphalt was freighted in along the water route via Waterways and Fort Simpson, and, in short, despite all difficulties, a usable runway was put in commission on September 1st, 1941,



Figure 5-7: Effect of snow on Nissen Hut at Fort Nelson

and immediately was taken advantage of not only by Canadian aircraft but also by American military machines on their way to Alaska.

The difficulties in the construction of a base at Watson Lake, which is just across the northern boundary of British Columbia in the Yukon Territory, were equally severe as those encountered at Fort Nelson although of a somewhat different character. It was possible to freight most of the supplies for the construction project into the airfield site by water, although this entailed two portages of 72 miles, and 26 miles respectively. The successful completion of an airport at this lonely northern location is another example of the ingenuity and persistence which has characterized the development of flying in the Canadian north during the last quarter of a century. All the material was assembled at Vancouver in the spring of 1941. In addition to the requirements of the construction project itself, the means of transportation also had to be constructed. These consisted of one stern wheel river steamer, three shallow draft power boats and 12 barges, which were built in Vancouver and then taken apart for shipment by coastal steamers to the port of Wrangell, Alaska, which is in the long Alaskan panhandle running down the north-west coastal regions of British Columbia. There these craft were reassembled and were used to freight supplies from Wrangell up the Stikine River to Telegraph Creek in British Columbia. At this point all the freight had to be removed from the power boats and barges and carried 72 miles overland to Dease Lake, which is an almost forgotten center of the gold rush which characterized the ... north country at the end of the last century. There was a road of sorts running from Telegraph Creek to Dease Lake, but generally speaking it was in very poor shape and by no means suited to the requirements of heavy freight traffic. Consequently, before freight could be moved over it much work had to be done in re-building the road and especially in strengthening bridges. From Dease Lake supplies were floated down the Dease River into the Liard at Lower Post, which is a famous old trading station - the most northerly in British Columbia, to the best of my knowledge. From Lower Post to the site of the airport at Watson Lake, it was necessary to build 26 miles of road. Despite all these difficulties, the first truck-loads of freight reached the airport site on July 9th, and in less than two months of the most concentrated effort, an adequate runway was ready for use and was in fact being used on September 2, 1941.

In the meantime, work of extension and improvement on the fields at Grande Prairie and Fort St. John at the southern end of the route, and at Whitehorse at the far northern end, had been proceeding without particular incident. The result of these combined efforts was that, by the beginning of September, a complete airway suitable for use in favourable weather had been



Figure 5-8: Control tower at Watson – Winter

completed and was actually in operation. It is significant to note that this work was completed more than three months before Pearl Harbor.

The whole picture changed completely one Sunday morning in December, 1941. The infamous attack on Pearl Harbor, and the swiftness with which the Japanese endeavoured to take evil advantage of the surprise which they had achieved, brought a desperate threat to the security of the Western coast of this entire hemisphere. It was now that the wisdom and foresight of the men who had been responsible for pushing ahead with the North West Staging Route became apparent. By one of those miraculous coincidences which have sometimes assisted the cause of freedom in this war, on December 9, 1941, the Department of Transport, in Ottawa, was able to announce that radio range facilities, on the North West Staging Route, were now completed and had had been put into operation. This meant that weather, which in any case is remarkably stable in the country which lies immediately east of the Rocky Mountains, had little effect on the flow of traffic to and from Alaska. In the critical months of 1942, when the Japanese were threatening to extend their domination to include the entire Aleutian chain, and their naval control to include the inner passage between Vancouver and the Alaskan panhandle, the North West Staging Route remained as a virtually unassailable artery, sheltered behind the tremendous barrier of the mountains, and removed from attacks even by long-range aircraft.

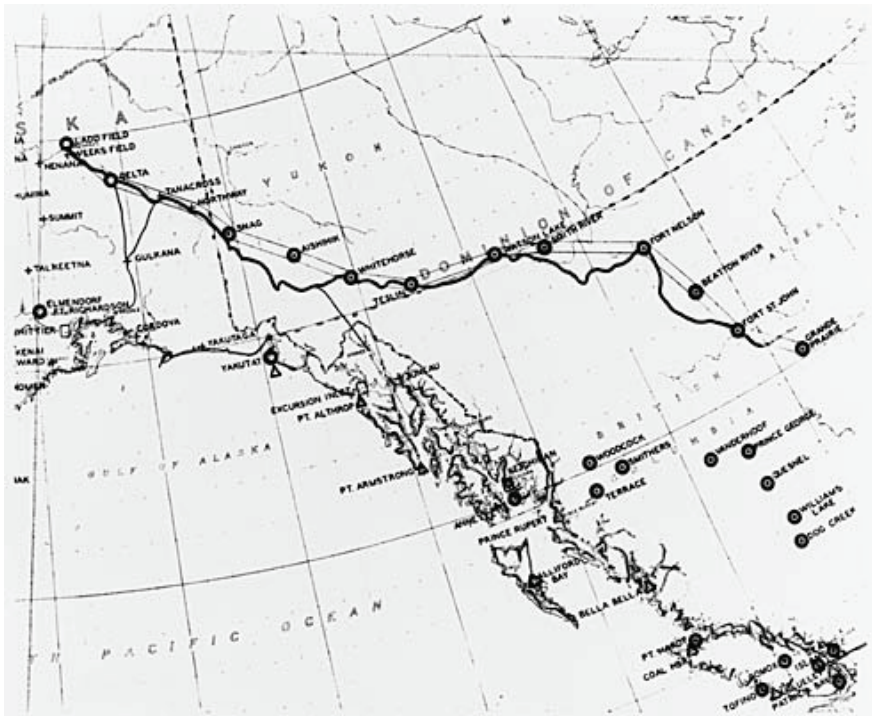
However, in conception it was designed for a moderate-sized civilian operation, and not for the tremendous flow of military air traffic—which ranged from the smallest and fastest single engine fighters to the largest bombers and transports ever built—which had to be carried over it from the beginning of 1942 onwards. In view of this the United States government was anxious to make considerable extensions to existing facilities at each of the fields in order to meet these traffic requirements. Canada, already in a war in which she had been participating for more than two years, operating the largest scheme for training aircrew which the world had known up to that time, and with large military, naval, and air forces throughout the world, was not able to provide, from her relatively tiny population, the manpower required for the job. On the other hand, her powerful neighbour, with a tremendous population, was in possession of the resources required, and in one of these great demonstrations of friendly cooperation which have characterized the relationship of the United Nations throughout the present war, freely undertook to do all the construction work necessary. Work went ahead on that basis, but with the very important proviso, which was undertaken completely voluntarily by the Canadian government, that all work carried out on the airfields which was of a permanent nature would be regarded as an expense for which Canada would assume full responsibility. Parallel with the extensions to the North West Staging Route bases, United States construction agencies built the Alaska Highway, which runs along a roughly parallel course from Dawson Creek to Fairbanks. The construction of the Highway, one of the major engineering miracles of the present century, is a subject on which no elaboration is needed. It is complementary to the North West Staging Route, in that it provides a means for inexpensive transportation of heavy freight and fuel required in the operation of the airfields. The building of the fabulous Canol pipeline across the Mackenzie mountains from Norman Wells to Whitehorse, and Fairbanks, providing a fuel supply which was free from the dangers of Japanese submarine attack, is also closely linked with the development of the North West Staging Route.

The immense construction program undertaken by the United States government on the three major north-west defence projects was pushed ahead with fantastic speed during 1942. The Alaska Highway, or rather the pioneer road on which the present Highway is based, was built in 7 months during the summer of that year. The runways at the main air bases of Grande Prairie, Fort St. John, Fort Nelson, Watson Lake, and then to Whitehorse were extended and paved with concrete. The intermediate fields at romantic sounding but desolate and lonely spots like Smith River, Aishihik, and Snag, were constructed in between the main bases to provide a maximum safety of operations. The back

of all this construction work was broken by the end of 1943. In the meantime the smashing defeat of the Japanese navy in the Battle of Midway, which put an end, at one blow, to Tokyo's ambitions for dominating the Eastern Pacific, and the eventual expulsion of Japanese troops from the Aleutian chain, largely removed the dangers to combat which the North-West defence projects had been undertaken.

In September 1942, the RCAF took over operation of the Staging Route. Its operations began on a small scale, and were conducted by men who fortunately had a genius for improvisation, which proved quite invaluable during the time that the main body of the construction work was being carried out. Previously, traffic control had been exercised by the Department of Transport, and the change to RCAF control was undertaken because the route had become predominantly a military affair.

At the end of 1943, the RCAF organized an airways traffic control center in Edmonton. This is like the dispatcher's office of a great railway junction, where a duty controller maintains a complete check on the movements of all aircraft



Map 5-2: The Northwest Staging Route, no date. Yukon Archives. Department of Defence Collection, 91/37 #51, PHO 419.

over more than 1,500 miles of the airway from the 49th parallel to the Alaskan boundary.

In June 1944, the RCAF's North West Air Command was formed to take over complete operation of the route. Many of its senior officers were men with long experience in northern flying. The air officer commanding, Air Vice-Marshall (A/V/M) T.A. Lawrence, had carried out surveys for the RCAF in the Eastern Arctic (at the Hudson Strait) in 1927-28, and both the chief staff officer and the senior air staff officer were veteran bush pilots. In addition, many of the pilots engaged in flying RCAF aircraft over the route had long civilian experience in bush flying.

North West Air Command also operated a Communications Flight, equipped with smaller aircraft, whose duties included flying freight and passengers to any point in the north-west between the 49th parallel and the Arctic Ocean. Their activities were by no means confined exclusively to RCAF operations. On innumerable occasions, they assisted various other departments of the Canadian government, including the R.C.M.P., in conducting urgent business throughout northern Alberta, northern British Columbia, the Yukon Territories [*sic*] and the Mackenzie valley. For example, in the fall of 1944, a schooner which was carrying as passengers almost all the native reindeer herders who look after the large herds of reindeer at the mouth of the Anderson River, east of Aklavik, was driven aground in an Arctic hurricane and all hands drowned. A Norseman of the Communications Flight immediately proceeded to the scene and was able to render extremely valuable assistance not only in locating the wreck but also in making arrangements for the valuable herds to be cared for. A few days earlier, another Norseman of this flight had returned from a trip to the regions north of Churchill on Hudson Bay after assisting the United States authorities to bring out the personnel of weather stations in the remote district of the eastern Arctic.

This flight normally flew more than 100,000 miles a month over many thousands of square miles of territory. During 1944, it flew roughly 1,000,000 miles over the north-west.

In order to maintain the air force bases in the north it was necessary to establish a large scale trucking operation over the Alaska Highway between Dawson Creek at the southern end and Snag, which is an intermediate station of the North West Staging Route almost on the Alaska boundary. This freight trucking unit carried between 300 and 400 tons of food a month, as well as other supplies to stations along the route. Its total poundage of freight carried during 1944 was 5-¼ million pounds.



Figure 5-9: Terrain features from the air, Whitehorse to Aishihik

The development of the Staging Route by joint Canadian-American effort is an achievement worthy of pride. This effort, as a means to three objectives, has proved to be a worthy one, as the voluminous delivery of aircraft to Russia was accomplished with an impressive safety record; a springboard for the final offensive against Japan was provided; and a vital link in Transpolar air routes was forged. This last feature has great significance for the future, as air facilities established in this area make safer and shorter the route from San Francisco to Tokyo and make possible a route from London to Tokyo.

Coastal Command Operations in the Arctic Areas

While in the early part of the War Canadian Coastal Command Squadrons operated from Canada, there were individual Canadians in the RAF operating from the United Kingdom. Later on RCAF Squadrons did operate from the United Kingdom but mainly in the Western Approaches and North Sea.

The first of these far northern operations were from Invergordon (Eastern Scotland) to the Greenland Sea in the vicinity of Spitzbergen.² The pilot of the aircraft on this operation was Wing Commander L.W. Skey, a Canadian in the RAF, flying the Guba flying boat. This operation was for the purpose of ice and meteorological observation, and the study of navigational problems in the north. On the return journey bad weather was encountered necessitating a

² *Editor's Note:* Now known by the Norwegian name of Svalbard.

landing in Iceland, which at the time was a neutral country. According to international law the aircraft was impounded, but subsequently released and flown back to Invergordon. From this time on Coastal Command operations in the northern waters expanded.

The first flight and landing at Spitzbergen was made in early summer 1941. These continued until the last flights of the year were made in late August and early September.

The general terrain of Spitzbergen is mountainous, with the exception of a few flat areas in the northern part, one of which was used by the Germans for a landing ground; the southern part was used by the RAF and the allied occupation forces. In the summer the coastal areas of the islands are partially uncovered exposing bare rock, while the central part is permanently covered by ice and snow. In the spring in the vicinity of Spitzbergen, temperatures were encountered as low as -40°C , along with heavy supercooled fog which was transformed into ice particles on impact with the aircraft.

In late August and early September 1942, Coastal Command aircraft from the U.K. flew to Russia and were based at Grosnaya near Murmansk and Lake Lahkta near Archangel, for operations in conjunction with allied convoys proceeding to Murmansk and Archangel. These operations presented some difficulties owing to inaccurate maps, lack of weather information and compass error due to the high latitudes. Hampden torpedo bombers, based near Murmansk, were also used on these operations. Weather conditions in the area north of Murmansk were quite good during the late summer months, except for heavy coastal fog found in that area. At Murmansk the temperature ranges, approximately, between 55°F [13°C] at night, up to 75°F [24°C] during the day. However, in October a rapid temperature inversion occurs and the first snow is seen in that area about mid October. Conditions at Archangel are similar, but with higher day temperatures ranging up to 85°F [29°C]. During the winter Murmansk remains open to shipping, but Archangel is closed as the White Sea freezes over. In mid summer, in this latitude embracing Murmansk and Archangel, it is light for 24 hours, but in mid winter there are approximately 16 hours darkness, 2 hours twilight and 6 hours light.

Murmansk is just south of the limit of the tree line, above which is the tundra scattered with patches of moss and shrub. To the north east of Murmansk, i.e. Russian Lapland, the tundra area is flat with many small lakes. Archangel is surrounded by flat, heavily timbered country where the lumbering industry thrives.

The living accommodation was in barrack-type buildings supplied by the Russians. While similar to the RAF type of barrack block and adequate, they were found to be inferior with regard to sanitary and sleeping facilities.

Meat in these areas was extremely scarce, also eggs and milk, while rye bread and brown wheat bread was plentiful. A typical days menu is as follows:-

Breakfast- A choice of hot chocolate, fruit compote or tea (Russian type), followed by boiled porridge made of millet seeds, containing when possible a small cube of meat of a doubtful origin supplemented by some 12 to 15 thick slices of bread. Occasionally there was butter supplied for the bread.

Lunch - Choice of same beverages as breakfast: soup, made of such things as cabbage with a heavy grease content; occasionally potatoes and a very meager portion of meat. Bread was again supplied with this meal and officers were allowed cheese.

Supper - Similar to lunch.

All food supplied to these localities came from the following places: [bread] from the Caucasus, wheat and rye from the Ukraine, butter and cheese from Siberia, meat locally. On two occasions a special dinner was arranged where the food was excellent, consisting of Caviar, Lake Trout, Cray Fish, Mushrooms and Vodka.

Alcohol consisted of Vodka and Caucasian wine in limited quantities.

Major operations ceased in this area in October 1942, when the Squadrons were withdrawn to the United Kingdom.

FIGHTER SQUADRON OPERATIONS IN THE USSR

In July 1941, Pilot Officers J.E. Walker and D.L. Ramsay of the Royal Canadian Air Force volunteered for service abroad with the RAF. In August 1941, the aircraft carrier HMS *Argus* departed from Grenock, Scotland with 24 aircraft and pilots of 151 Wing aboard, bound for an unknown destination. On 7 September, 1941, personnel were advised that they were approximately 100 miles north and 40 miles east of the Tumola River which empties into the Barents Sea, and that carrier and escort could not proceed further due to the presence of enemy aircraft.

The procedure for the take-off and subsequent flight to Vayenga airport, approximately 20 miles from Murmansk, was very elementary. Six aircraft at a time were raised to the flight deck and flown off individually in rapid succession. Rendezvous was made at cloud base (200 feet). As the aircraft compasses were of no use, due to excessive deviation, the flight routed itself over the carrier towards a destroyer which was stationed in the correct direction to be flown and the entire flight was then made on this bearing maintained on the gyro compass.



Figure 5-10: A mechanic attaches the cable of a trolley-accumulator to a Hawker Hurricane Mark IIB on the waterlogged airfield at Vaenga, as a section of three Hurricanes flies overhead. Imperial War Museum CR 38.

The weather continued to deteriorate during the flight and at one time the ceiling was less than 50 feet, however, as landfall was made, the cloud base rose to about 500 feet. As a compliment to the Royal Navy navigation it should be noted that, although the last six days of the voyage had been made in dense fog the course taken by the flight over the carrier to the destroyer and beyond, brought them within a mile of their projected landfall. A coastcrawl was then made westward until the mouth of the Tumola River was reached, and by flying up this river the aerodrome was located and a landing made.

None of the pilots had made a carrier take-off and were advised to hold the aircraft down until the ramp on the forward end of the deck was reached. The first two pilots found that a Hurricane Mk. 2B did not bounce off as easily as carrier aircraft and one aircraft lost approximately 8 inches of each [propeller] blade and the other damaged his undercarriage to such an extent that it could not be raised. Notwithstanding these difficulties both aircraft were able to reach their destination and made a crash landing from which the pilots were able to walk away.

The airfield at Vayenga was built of packed sand in the form of a “Y” with a small lake in the opening part of the Y. Off the edges of the aerodrome were built individual hangars, one for each aircraft. These hangars were of long construction and half sunk in the ground. A slot approximately 3 feet deep was left open at the back, and the front was boarded in from the wings up, with

sufficient space for the [propeller] to turn over. When the aircraft was in the hangar, boards or sheets of canvas were used to close the front opening.

For the take-off the pilot started the aircraft, taxied directly from the hangar, and took off across the broad expanse of sand.

By October snow was falling and the aerodrome was kept serviceable for flying by the Russians by rolling in the same manner as used in Canada. To eliminate ripples caused by the rollers, a drag, consisting of 3 twelve inch logs, was dragged behind the rollers. No serious trouble was encountered in keeping the aircraft serviceable; each aircraft was heated by a kerosene heater attached by a canvas tube to the engine cover. This cover was quite loosely fitted and was lined with asbestos where it came in contact with the exhaust stacks. This permitted the cover to be fitted immediately after the aircraft taxied to its hangar which was not removed until immediately before starting the engine for the next flight or inspection. As flying personnel were equipped only with normal RAF flying clothing, certain discomfort was experienced when flying during the colder days, the temperature dropping to 25° or more below zero. It should be noted that 12 additional aircraft were transported to Archangel. These were assembled and flown to Vayenga. This provided the Wing with 2 Squadrons of 18 aircraft each. In view of this limited supply of aircraft very little flying was done except when any aircraft were definitely in the area. The Early Warning System was rather unreliable and rarely were the flying personnel able to take-off before the bombs were dropping on the aerodrome.

In regard to living facilities while stationed at Vayenga aerodrome; the quarters were two storied, brick, barrack block type of buildings; steam heated and quite comfortable. There were smaller one room buildings, whose heating arrangement consisted of a large stone fireplace situated in the centre of the room. This fireplace had unusually thick walls which held and radiated the heat for long periods, consequently a fire was kept constantly burning in periods of cold weather.

Food was of the Russian type and exceptionally good. There were plenty of eggs, milk and a type of tinned ham. Bread and butter were plentiful but the water was poor and so it was necessary to drink either champagne or other wines. Tea was available that was sweetened by the juice of fruit compote (a favourite Russian dessert) as there was a scarcity of sugar. In addition to the above, borsch (vegetable and meat soup) was served, also plenty of fresh fish and caviar. Russian food generally was quite greasy.

Living conditions for the fighter personnel were on the whole much better than those experienced by the coastal command squadrons.

Chapter 6

POST WAR OPERATIONS

Introduction

This chapter attempts to give an insight to the post-war and present operations of the RCAF. As this organization tends to develop and broaden, not so much in material size, but in thought and idea, it will be impossible by reading here to learn of the very latest developments. However the general trend is inflexible enough to leave the correct impression.

One of the many valuable services performed by the peacetime Air Force is Photo Survey work. This work is constantly helping to push Canada's frontiers back and to develop areas already settled. Approximately 700,000 square miles of the Dominion were photographed in 1947 and some radical discrepancies were noted with already existing charts of the Arctic Islands.

The RCAF also maintain scheduled flights along the Northwest Staging Route and to Churchill, as well as special flights to isolated posts.

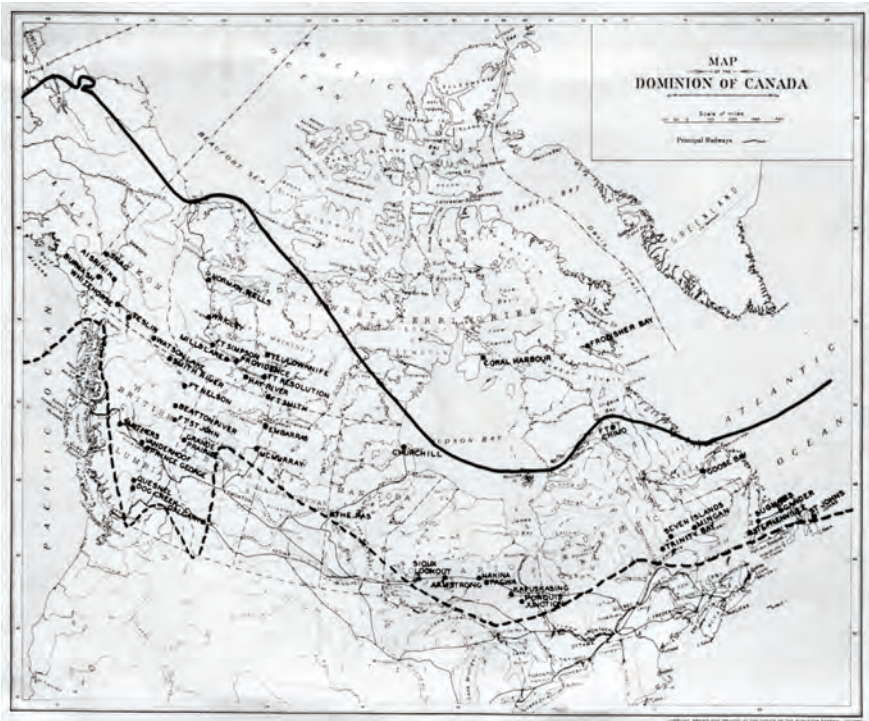
Some of these isolated posts are new landing strips and weather stations which are being constructed and manned in accordance with U.S.-Canadian defence agreements and to provide world wide weather information.

Due to technical difficulties some of these posts are almost completely manned and staffed by U.S. personnel with the exception of the Commander Officer (C.O.) who is a Canadian. It is the policy of the Dominion Government to man such posts completely with Canadian personnel whenever such personnel can be made available.

Considerable progress has been made by the RCAF in ascertaining the location of the Magnetic Pole which is of vital importance in the worlds of geography, navigation and physics.

The RCAF is performing notable feats in Air/Sea Rescue work, [such as the rescue of Canon Turner], and it is the intention to increase these facilities in the future.

Several exercises and operations have been carried out to learn more of Arctic areas, to study air lift problems, to find the answer to navigation problems and many others. In short, by diligence and intelligence, [these activities] show to Canada and the World that her Northland, rather than a frigid waste, is a land of wealth, beauty and potentiality. The strategic



Map 6-1: Arctic and Subarctic Airfields in Use by the RCAF, 1946

importance of this Arctic area can be seen at a glance of a world polar projection. However, it is not the intention to dwell on this subject at this time.

Hereunder are more detailed reports of actual operations which by diary and photo give a close-up inspection of their particular scene of activity.

PHOTO SURVEY

Operating over many parts of Canada from Labrador to British Columbia, and from the American border to the Arctic, the RCAF's two photographic squadrons are now in the midst of the busiest season of aerial survey work since the Air Force began this job in 1924. Nos. 413 and 414 Squadrons, based at Rockcliffe and coming under No. 22 Photo Wing, responsible to Air Transport Command, hope to cover mainly Eastern Arctic and Sub-Arctic areas this season. In 1946, approximately 400,000 square miles were covered while in 1947 the area was enlarged to 700,000 square miles, the largest seasons work up to that time.

Present Activity - The work this season is being carried out by nine separate detachments of the two squadrons, employing 22 aircraft and about 250 air and ground crew personnel in the field. The first aircraft left their Rockcliffe base



Figure 6-1: Canso aircraft used for Photographic Survey and other northern operation

April 20th as the season's work got off to one of the earliest starts on record, and the last aircraft – a specially equipped Lancaster, used on this work for the first time – left the second week in July.

The 1948 programme features an accelerated and expanded activity, thanks to the advantages over previous years of improved equipment and methods, to say nothing of experience. Among the new equipment being used are improved navigational aids, more efficient aircraft, and a special camera designed and built in England to RCAF specifications.

Areas to be photographed must be free from ice and snow, and low-lying or patchy clouds must be absent. Thus, in the case of many of the northern areas, the job of taking suitable photographs becomes a race between the aircraft and their crews and the weather. The season must be followed northward, and photos taken as ice and snow melt. In some areas, however, convection cloud forms as the land warms, and it is not unusual for the crews in some regions to have only a few days during the entire season that permit them to take proper photos.

The photo work of the RCAF is done in co-operation with the Department of Mines and Resources and other government departments which make use of

the pictures taken by the Air Force. Work to be done and areas to be covered are decided by the Inter-Departmental Committee on Air Surveys, and the Air Force undertakes those jobs not practical for commercial air survey companies. Pictures taken are turned over to Mines and Resources, the Army, and others, who use them for mapping and many other purposes.

Types of aerial photos taken by the RCAF fall into two groups: Vertical and Tri-camera. Vertical photography, the original method, is used for mapping and for *detailed* exploration and analysis. Tri-camera photography is intended for *basic exploration*.

Specific examples of the two types are as follows:

VERTICAL

- Water power development (e.g., the Columbia River Valley project);
- Soil reclamation and irrigation projects, and land development for soldier settlement;
- Mineral exploration;
- Hydro graphic survey for inland waterways;
- Forestry Service;
- Photography coverage of flooded areas at flood height, for dyke projects.

TRI-CAMERA

- Coverage of large areas where photos are needed immediately;
- Coverage in cases where large-scale maps are not required;
- General survey from which likely areas will be chosen for detailed survey.

In vertical photography only one camera is used. It takes a series of overlapping pictures (a line overlap) of the ground. In theory, the centre of each picture represents the ground directly below the aircraft at the time it was taken.

From tri-camera photos geologists can select areas for further investigation where ores or oil are likely to be found. Agricultural experts who understand photographic interpretation can tell where good farm lands are located. The cordage of forests can be estimated more accurately from the air than from the ground! Similarly, experts in other fields can obtain from tri-camera photographs information which will lead to the most economical use of the facilities available for vertical photography.

Housed at Rockcliffe is No. 1 Photo Establishment, one of the most modern air survey photographic laboratories possessed by any country. This unit processes all survey films and makes the necessary prints to be used by the

various survey sections. During 1945 and 1946 approximately 3,320 reels or 372,930 feet of film were developed as the result of squadron operations. One printing room alone produces over 100,000 service prints per month. This unit is also the centre for many other photographic processes of value to the RCAF.

The detachments sent out each summer may be stationed in airport buildings or under canvas, depending upon their location. In camps in out-of-the way localities, as for example in the Northwest Territories, living conditions are rigorous. Firearms are carried and the men shoot most of their own requirements of fresh meat; they also catch their own fish.

Along the shore of Hudson Bay the temperature in dimmer rises to a high of about 80° Fahrenheit [28°C] by day and drops to 40° [4°C] or so at night. Inland areas are somewhat warmer.

The greatest discomfort by far in the North is the ever-present plague of flies and mosquitoes with which everyone is cursed; in spite of DDT, repellent greases and protective clothing, the insects cause more annoyance and misery than any other factor.

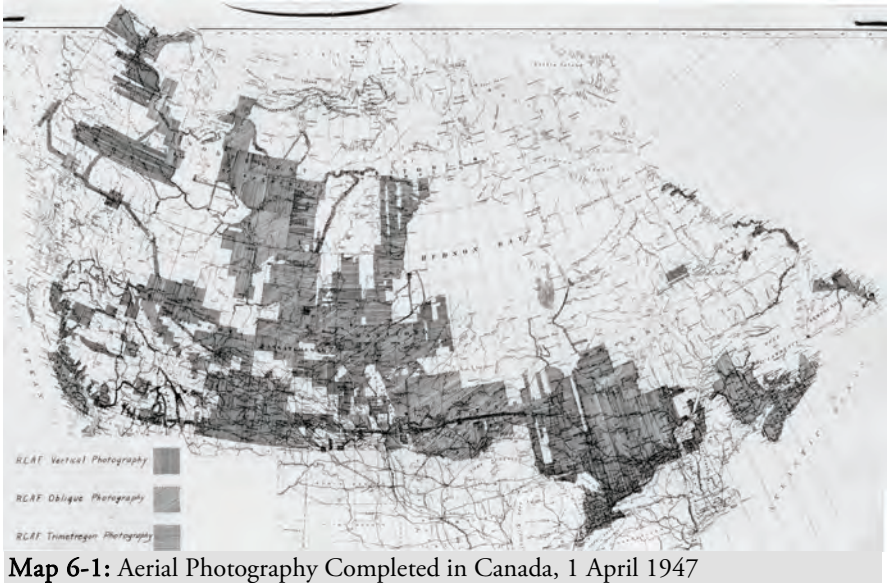
From an operational standpoint, the greatest handicap in the North is the short season. Photographs must be taken when there is very little snow or ice on the ground.

All operations are controlled from the "Ops" Room at Rockcliffe, shifting detachments here and there to take advantage of the best weather conditions. Detachment commanders in the field, however, are given wide powers of discretion. All the work is recorded in the operations room as soon as it is signalled in by the detachments. When one operation is completed, the crews are told where to move for the next job.

The RCAF does not subscribe to competition with civil air lines for the easiest jobs; the RCAF instead accepts those assignments which would not make workable contracts; hence the large proportion of Northern survey accomplished by the air force crews. Even prior to governmental insistence on co-operation, mapping operations had been dove-tailed. The Army signals and the meteorological service also benefit from the Air Force work, and these in turn assist the air survey detachments and other RCAF units.

The RCAF is of assistance to the civil air lines also in that many air force pilots when they leave the service continue to do the same type of work with those companies.

Greater use of air survey photography per capita has been made in Canada than in any other country, due to the unique geographical features of the Dominion and because as yet the greater portion is still explored only by air. The RCAF in continuing its air survey activities is making a large contribution to-the exploration and development of Canada's resources.



Map 6-1: Aerial Photography Completed in Canada, 1 April 1947

One of the most interesting recent contributions to correcting the existing charts and maps was the re-discovery in 1946 of the Spicer Islands in Foxe Basin north of Hudson Bay. These islands were reported in the ship's log of an American whaling vessel skippered by a Captain Spicer of Groton and New Bedford, [Massachusetts], as follows: "On the 7th August (1869) was beset. What I took to be water ahead turned out to be reefs and low-lying land, now called Spicer's Islands - hardly seen from the decks at high water."

Spicer's discovery is mentioned in a Department of Marine and Fisheries report entitled "*An Expedition to Hudson Bay - 1897*". But when the American arctic explorer Donald MacMillan sailed over the supposed location in 1921 he found nothing. In 1946 the RCAF confirmed the existence of the islands and a dead reckoning position of Latitude 68° 08' North and Longitude 79° 10' West was obtained.

SEARCH AND RESCUE

The RCAF Search and Rescue Organization stands ready at all times to carry out mercy flights in the Arctic and have to date many successful flights to their credit.

The job may be to look for a missing airliner down at sea, or it may be to put down on a "homemade" landing strip in the Far North to bring out an Eskimo [Inuk] or missionary requiring immediate hospital attention.

Behind all such operations is a carefully-planned organization, stretching from coast to coast, co-ordinated and largely operated by the RCAF. Search and

Rescue, however, is not designed to displace existing means of assistance to distressed persons. Its primary responsibility is to carry out Canada's international commitments under ICAO [the International Civil Aviation Organization] and, in addition, it stands ready to operate as a mercy organization within Canada whenever a life and death matter comes up that is too big for anyone else to handle. When a request is received from existing agencies, such as local authorities or a government or provincial department, the job is started. A call from an individual may start an operation, but a check is made with other authorities to ensure that the matter is not, or cannot be, handled satisfactorily by them, or perhaps by a commercial agency.

All resources of the RCAF, as well as those of Navy and Army, and other government departments, are available, but planes and other equipment are based at various points across the country, ready at any time for straight Search and Rescue operations, and in most cases these suffice.

Control is carried out from five major co-ordination centres at Halifax, Trenton (Ont.), Winnipeg, Edmonton, and Vancouver. Aircraft earmarked for mercy flights or search operations are stationed at Greenwood, N.S.; Mingan, P.Q.; Trenton; Winnipeg; Edmonton; Ft. Nelson, B.C.; Whitehorse, Y.T.; and Vancouver. ... Although planes at these points held for specific Search and



Figure 6-2: Norseman - Search and Rescue and general utility aircraft of the North

Rescue work are allowed to carry out certain other duties, they are never allowed to undertake jobs which would prevent them from being instantly ready for their primary responsibility.

Recent additions to the list of primary facilities of the Air Force for Search and Rescue work include helicopters, and a group of 21 carefully trained airmen who recently finished an intensive course in para-rescue work near Jasper, Alta. These men, now stationed at Greenwood, Trenton, Edmonton, Whitehorse, and Vancouver, are available to parachute at any time from Air Force planes to aid persons in distress. Hand-picked volunteers, they were selected for their woods experience, physical ability to carry out arduous duties in the wilds, and general [keenness] and intelligence. A summer-long course included numerous parachute jumps into rugged country, woodsmanship, mountaineering, first-aid, and many other subjects. So carefully were they trained that every one of them could, if the occasion arose, assist in the delivery of a baby.

Also ready for Search and Rescue work are the vessels and men of the RCAF Marine Section. Marine units are stationed at Dartmouth, N.S., and Vancouver, as well as at Trenton.

Nerve centres of the work are the major co-ordination centres, for from them are directed all operations by Search and Rescue. Huge charts in the operations room at each centre show the locations of all Service and civilian aircraft known to be flying in the area, and where applicable, ocean-going shipping is also plotted. Ready for instant use are lists of all Service facilities ready to be called upon, including Navy carrier planes in addition to RCAF aircraft, bodies of men for search parties, and vessels, as well as outstanding civilian facilities, such as air charter companies, tugboats, and the like.

Supplies dropped by aircraft often play a big part in Search and Rescue work, and ingenious methods have been worked out, especially for marine operations. Most spectacular of these is the Lindholme gear, a series of five containers linked by rope and dropped from the bomb racks of a Lancaster without parachute. The centre pack contains a large rubber dinghy which inflates upon striking the water, bursting open the container. The other four containers float upon the surface, still linked by rope to the dinghy, and contain emergency supplies. The gear is dropped in such manner as to drift down wind upon the survivors, spread out in a wide line.

Development of new dropping gear and emergency packs, and improvement of existing ones, is going on all the time within the Air Force, and latest of these to be developed is a special medical kit brought out by the Institute of Aviation Medicine in Toronto. Previous experiences showed the difficulty of successfully dropping fragile medical supplies, especially when required in large quantities, even though parachutes were used. The new kit holds medical supplies of all

sorts and is designed to accommodate supplies for ten persons. Each article is carefully packed in the kit to sustain shock, and a collapsible splint and stretcher are among the various articles included.

In the fall of 1947 at the difficult freeze-up time word was received that Canon [John H.] Turner, an Arctic Clergyman of the Church of England, had accidentally shot himself in the head. A parachute squad with a doctor was flown in and dropped to aid the wounded man, and when a landing could be made on skis he was flown out. Unfortunately, Canon Turner died, but though the difficulties of the operation seemed insuperable at times the members of the rescue crew surmounted them with a spirit and courage that is highly commendable.

Just before Christmas in 1947, on lonely Nottingham Island, one of the Department of Transport meteorologists developed a heart condition that was steadily worsening. 435 Squadron received the call and two weeks after leaving, the rescue Norseman arrived back at Stevenson Field, Winnipeg, with the sick man aboard. This flight covered 3130 miles of forest, barren land and the treacherous ice floes of Hudson Strait.

The two above incidents are used only as examples of the work done by the organization. There have been many more of equal and less scope. The pertinent fact is that Canada has taken on the responsibility for maintaining Search and Rescue facilities for that area known as the Arctic Archipelago.

AIR TRANSPORT COMMAND

In 1943 transport work in the RCAF came under the direction of the Directorate of Air Transport Command controlled from Air Force Headquarters. The operating statistics for that year reveal that the Domestic mileage on the Service routes amounted to 4,096 miles, while the Overseas Mail route amounted to 7,500 miles—combining to make a total route mileage of 11,596 miles. During the year a total of 6,079,753 pounds of urgent express was transported within Canada, Labrador and Newfoundland, as well as to the Yukon. Passenger traffic over the routes amounted to 18,238 passengers during the same period. In addition, nearly 500,000 pounds of Dominion of Canada mail was carried between Moncton and Goose Bay.

In February 1945, the Directorate was established as a Group. The Group was responsible for all transport duties including the carrying of freight to hinterland stations, ferrying of aircraft, aerial photographic survey, and the carrying of mail to troops overseas. Special missions included mercy flights and the carrying of VIPs, as well as co-operating on combined services exercises.

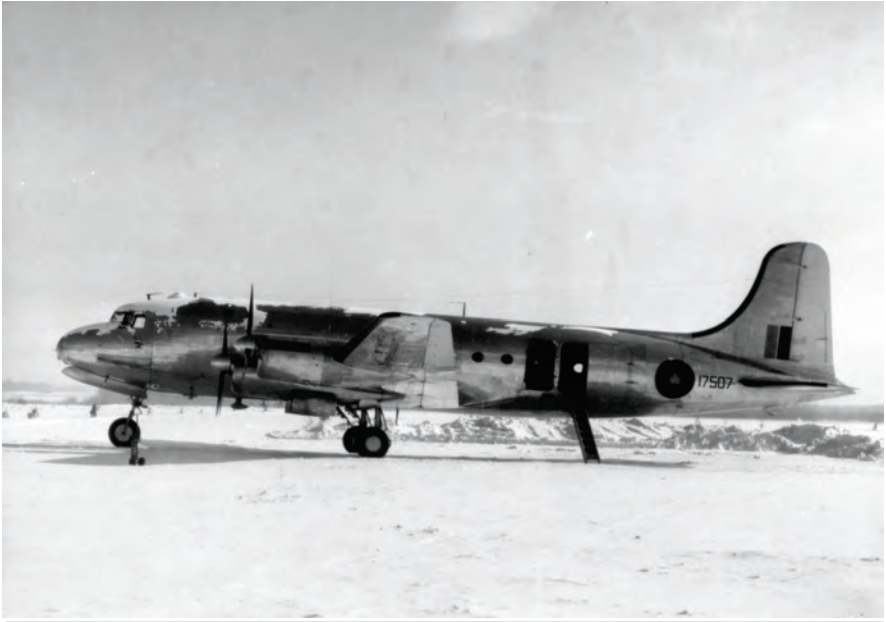


Figure 6-3: North Star aircraft used by the RCAF for transport duty

During 1947, 9 (Transport) Group flew 16,897 hours on transport operations, a total of over two million air transport miles. More than 23,000 passengers and over four million pounds of freight were carried. Fifty-five hundred hours were flown on photographic operations and special projects, and more than 400,000 square miles of Canada were photographed by crews from the Transport Group.

The inauguration of a new schedule of fast RCAF Air Transport flights linking Canada from Coast to Coast was announced by the Minister of National Defence on 17 May 1948. Operated by the RCAF Air Transport Command, four-engine North Star aircraft will be used on the main runs which link principal terminals from Goose Bay in Labrador to Whitehorse in the Yukon. Intermediate terminals will be serviced by an interlocking feeder system utilizing twin engine Dakota aircraft.

Main terminals for the scheduled runs are Montreal and Edmonton. The Eastern division of North Star flights operates from Dorval aerodrome in two sections; one direct to Goose Bay and the other on a twice weekly schedule via Moncton, N.B. and Dartmouth, N.S. The feeder service of the Eastern division operating Dakota aircraft includes Ottawa, Trenton and Toronto.

The fast North Stars will fly twice weekly between Dorval and Whitehorse, Yukon, and will connect with the Western division of feeder service operating

Figure 6-4: Inter-Command Air Transport Service, timetable effective 3 May 1948

READ DOWN		DORVAL—DARTMOUTH—MONCTON—GOOSE BAY				READ UP	
Flight 31						Flight 32	
Mon—Thur						Tues—Fri	
0900	Lv.....	DORVAL	(ET)	Ar	1630		
1215	Ar.....	DARTMOUTH	(AT)	MONCTON.....Lv	1515		
1345	Lv.....	DARTMOUTH	(AT)	MONCTON.....Ar	1345		
1430	Ar.....	MONCTON	(AT)	DARTMOUTH.....Lv	1300		
1600	Lv.....	MONCTON	(AT)	DARTMOUTH.....Ar	1130		
1830	Ar.....	GOOSE BAY	(AT)	DARTMOUTH.....Lv	0900		

READ DOWN		DORVAL—GOOSE BAY				READ UP	
Flight 33						Flight 34	
Wed						Wed	
0900	Lv.....	DORVAL	(ET)	Ar	1800		
1400	Ar.....	GOOSE BAY	(AT)	Lv	1530		

READ DOWN		DORVAL—ROCKCLIFFE—WINNIPEG—EDMONTON—WHITEHOUSE				READ UP	
Flight 35						Flight 36	
Mon—Thur						Tue—Fri	
0900	Lv.....	DORVAL	(ET)	Ar	2045		
0945	Ar.....	ROCKCLIFFE	(ET)	Lv	2000		
1045	Lv.....	ROCKCLIFFE	(ET)	Ar	1900		
1445	Ar.....	WINNIPEG	(CT)	Lv	1330		
1615	Lv.....	WINNIPEG	(CT)	Ar	1200		
1845	Ar.....	EDMONTON	(MT)	Lv	0800		
Overnight Stop					Wed—Sat		
Tue—Fri					Overnight Stop		
0800	Lv.....	EDMONTON	(MT)	Ar	1800		
1030	Ar.....	WHITEHOUSE	(YT)	Lv	1200		
					Tue—Fri		

NOTE: Watson Lake to be serviced through facilities of NWAC from Whitehorse.

READ DOWN		ROCKCLIFFE—DORVAL—TRENTON—TORONTO				READ UP	
Flight 25						Flight 26	
Wed—Sat						Wed—Sat	
0800	Lv.....	ROCKCLIFFE	(ET).....	Ar	1815		
0845	Ar.....	DORVAL	(ET).....	Lv	1730		
0930	Lv.....	DORVAL	(ET).....	Ar	1645		
1100	Ar.....	TRENTON	(ET).....	Lv	1530		
1145	Lv.....	TRENTON	(ET).....	Ar	1445		
1245	Ar.....	TORONTO	(ET).....	Lv	1400		
READ DOWN		EDMONTON—FORT St JOHN—FORT NELSON				READ UP	
Flight 1						Flight 2	
Mon—Thur						Mon—Thur	
0800	Lv.....	EDMONTON	(MT).....	Ar	1800		
0955	Ar.....	FORT St JOHN	(PT).....	Lv	1435		
1025	Lv.....	FORT St JOHN	(PT).....	Ar	1415		
1155	Ar.....	FORT NELSON	(PT).....	Lv	1255		

NOTE: Watson Lake to be serviced through facilities of NWAC from Whitehorse.

READ DOWN					READ UP
Flight 3	EDMONTON—CALGARY—REGINA—RIVERS—WINNIPEG				Flight 4
Mon—Thur					Tue—Fri
0900	Lv.....	EDMONTON	(MT).....	Ar.....	1630
1015	Ar.....	CALGARY	(MT).....	Lv.....	1515
1115	Lv.....	CALGARY	(MT).....	Ar.....	1415
1400	Ar.....	REGINA	(MT).....	Lv.....	1045
1430	Lv.....	REGINA	(MT).....	Ar.....	1015
Flag Stop only	Ar.....	RIVERS		Lv.....	Flag Stop only
1700	Lv.....	RIVERS		Ar.....	0830
Overnight Stop	Ar.....	WINNIPEG	(CT).....	Lv.....	Wed—Sat
Tue—Fri					Overnight Stop
0800	Lv.....	WINNIPEG	(CT).....	Ar.....	1730
1230	Ar.....	CHURCHILL	(CT).....	Lv.....	1330
					Tue—Fri

NOTE: Regina Fuel Stop only—no passenger will be emplaned and no freight will be emplaned or deplaned.

READ DOWN					READ UP
Flight 5	EDMONTON—CALGARY—VANCOUVER				Flight 6
Wed					Thur
0900	Lv.....	EDMONTON	(MT).....	Ar.....	1600
1030	Ar.....	CALGARY	(MT).....	Lv.....	1445
1130	Lv.....	CALGARY	(MT).....	Ar.....	1345
1415	Ar.....	VANCOUVER	(PT).....	Lv.....	0900

READ DOWN					READ UP
Flight 7	EDMONTON—CHURCHILL—BAKER LAKE				Flight 8
2nd and 4th Tue					2nd and 4th Wed
0900	Lv.....	EDMONTON	(MT).....	Ar.....	1330
1515	Ar.....	CHURCHILL	(CT).....	Lv.....	0900
Overnight Stop					2nd and 4th Thur
2nd and 4th Wed					Overnight Stop
0900	Lv.....	CHURCHILL	(CT).....	Ar.....	1515
1200	Ar.....	BAKER LAKE	(CT).....	Lv.....	1230
					2nd and 4th Wed

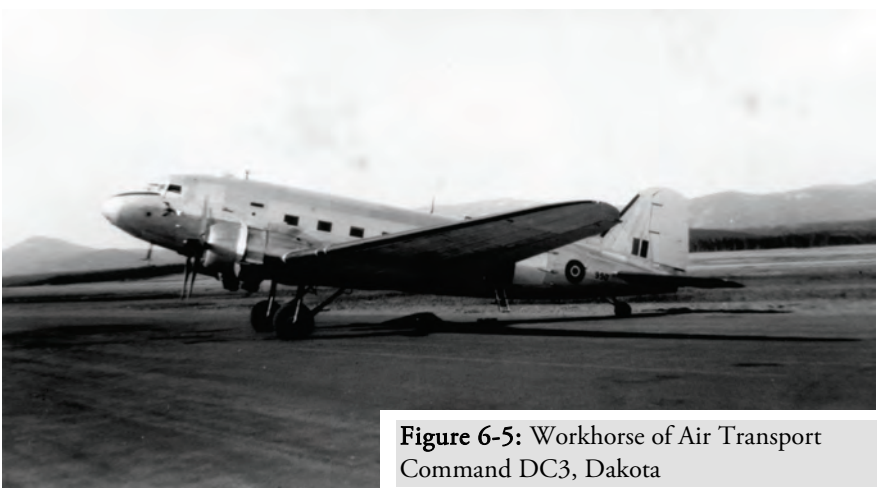


Figure 6-5: Workhorse of Air Transport Command DC3, Dakota

into Winnipeg, Churchill, Baker Lake, NWT., Rivers, Man., Regina, Calgary, Vancouver as well as various stations on the North West Staging Route.

The new schedule is designed to facilitate the rapid movement of service freight and personnel between various units and bases throughout the Dominion. In this way the Transport Command does useful work while carrying on essential training. In the event of an emergency, Transport Command would supply and keep mobile units like Fighter Interceptor Squadrons, as well as provide the planes and trained personnel for camping and servicing [airborne] troops.

WINTER EXPERIMENTAL ESTABLISHMENT

Introduction

The Winter Experimental Establishment was set up at Kapuskasing, Ontario, in the winter of 1943-44, and moved to Gimli, Manitoba, approximately 60 miles north of Winnipeg, in March 1944. The unit was subsequently transferred to Edmonton, Alberta, in October, 1945, and to Namao, ten miles north of Edmonton in 1946. In that year advanced bases at Fort Nelson, B.C. and Churchill, Manitoba, were located. The following year (1947-48) the Winter Experimental Establishment was based at Edmonton with advanced bases at Watson Lake, Yukon Territory, and Churchill, Manitoba. The aircraft proceeded to these bases late in October and, except for a short break at the end of the year remained there until the middle of March.



Figure 6-6: WEE Flight Aircraft at Watson Lake

The above mentioned unit was organized for the purpose of proving various types of aircraft and associated equipment under winter conditions, and to serve as a training unit for personnel who would be required for arctic operations. In the past, equipment belonging to other organizations (the United Kingdom Ministry of Supply, the Royal Navy and the United States Army Air Forces) has been tested at this unit. During the current season only equipment belonging to the Ministry of Supply and the Royal Canadian Air Force has been tested.

The aims of this establishment are to provide guidance in the design of new equipment for use in cold weather and to rectify faults in current equipment which limit the temperature at which it may be operated. This report contains general recommendations which are considered necessary in the design and operation of equipment at low temperatures.

The policy of the establishment is to operate aircraft under arctic winter conditions with a minimum of ancillary equipment. To this end, aircraft were always left at the dispersal points unless special modifications, installations or inspections required that the aircraft be sheltered, and in many cases these were carried out at dispersal points with improvised local shelter.

Meteorological Data

The two main meteorological factors affecting operations under arctic winter conditions are the temperature and the wind. Either factor alone is not sufficient to indicate the penetrating effect of the cold on a human body. To correlate these factors a unit has been developed which is called "Wind Chill" and is a measure of the quantity of heat lost from exposed flesh under various temperatures and winds. This factor is expressed in kgm. calories/sq. metre/hr. A chart showing chill factor as a function of temperature and wind velocity is included at the end of the Chapter.

The average January temperatures and wind chill throughout Canada are shown. Examination of the charts shows the following:

Base	Average Temperature	Average Wind Chill
Edmonton	-10°C	1050
Watson Lake	-20°C	1200
Churchill	-29°C	1600

From reference to the relative comfort scale on chart it is apparent that while Edmonton is very cold and Watson Lake bitterly cold, Churchill is indescribable. This statement is substantiated by Winter Experimental Establishment experiences and emphasizes the superiority of Churchill as a cold weather test base.



Figure 6-7: Airfield at Watson Lake

Equipment Under Test

The following aircraft and engines were tested with their associated equipment during 1947-48:

Aircraft	Engines
Lincoln II	Merlin68A Merlin 621
Lancaster X	Merlin 224
North Star	Merlin 620
Dakota III	Twin Wasp R1830-92
Sea Fury X	Centaurus XVIII
Meteor IV	Derwent V
Firefly IV	Griffon 74
Mustang IV	Merlin V1650-7
Prentice	Gypsy Queen-32
Vampire I	Goblin II

All were standard service aircraft although some modifications recommended from the previous season had been incorporated to facilitate winter operation.

Tests were carried out on the ground handling equipment associated with the above aircraft, and on special equipment required for servicing aircraft during winter operations.

During this season the RCAF winter ground crew clothing and aircrew clothing together with some special RAF clothing were tested as to their suitability in the event of a forced landing in the Arctic. New developments were made in containers for emergency equipment.

Some results of the tests on the above equipment are summarized.

FLIGHT OPERATION

The problems which arose in flight under arctic winter conditions were the least difficult of all factors affecting operation from northern detachments. Once airborne, the aircraft functioned quite satisfactorily and, for the most part, aircrew carried on successfully using normal operating procedures. There were, however, one or two problems which warrant consideration.

Aircrew Survival

By far the most important consideration facing aircrew operating in the north is that of survival in the event of being forced down. Technical difficulties with aircraft and equipment on the ground are being solved at a satisfactory rate, but the problem of survival, difficult but not impossible, has been almost completely ignored until now it ranks first among the problems requiring urgent attention.

Glare-Iced Runways

Some difficulty was experienced early in the current test season when planning to ferry the Meteor IV from Edmonton to Watson Lake. Runways of 5500 feet long, when covered with glare ice, are not long enough for modern tricycle undercarriage fighters of high wing loading. Preliminary studies indicate that the benefit to be expected from present forms of ice grip tires is slight. The only solution for the present, to ensure operation through all seasons, appears to be longer runways.



Figure 6-8: WEE Flight Aircraft, Watson Lake

Temperature Inversions

A problem which may be significant for tactical considerations is that of large temperature inversions which occur most markedly near the ground in the Canadian northern winter. An attempt was made to measure these inversions daily to give some statistical evidence of their extent, but, unfortunately, only a few such measurements were successful. The greatest inversion encountered was a rise of 13 degrees centigrade from -20°C to -7°C between ground level and 4,000 feet. This gives rise to a 2.5% variation of Mach number but it is probable that greater inversions giving more serious results do occur. In the event that operations were contemplated where the speed was to be near the critical Mach number, a shallow dive into the inversion could spell disaster.

WATSON LAKE, YT

This detachment is one of the links in the chain of the North West Staging Route. Situated about 200 miles south of Whitehorse on the shore of Watson Lake and 8 miles west of the Alaska Highway. Its function is, as well as maintaining the route, to provide a base of operations for Winter Experimental Establishment (WEE) flight who from time to time use this airfield and environs as a testing area for various types of aircraft, armament and other equipment. The Department of Transport have a detachment here and maintain the range station and flying control. Canadian Pacific Airlines use



Figure 6-9: Hospital and Mess - Watson Lake

Watson as one of their terminals and have their representatives there. There is also a representative of the RCMP who makes Watson Lake his base of operations.

The number of RCAF personnel on regular strength is approximately 60 and these are under the command, at present, of Flying Officer R.V. Smith who has been there for slightly over a year. He is quite happy with the efficiency of his station and men. He states that morale and discipline are good and that the men are happy to be posted there. This seems to be generally true of fairly isolated northern stations and units. Personnel are quite happy because, I think, they always seem to be busy. There seems to be more “elbow room.” A certain amount of isolation is to be desired rather than abhorred and generally a spirit of comradeship exists that is not so often found in the same degree on the stations as the more populated areas. When a unit such as WEE arrives there the Officer Commanding has a station strength of approximately 150 persons.

The number of RCAF buildings on the detachment is 52 and these are of excellent log construction (with the exception of the hangar) and range in size anywhere from a very small store house to the larger Administration and Flying Control building. In accordance with a general plan throughout the Air Force several of these buildings are being converted into married quarters. These are expected to be completed by next summer and will number 35 suites. These are for both officers and men and an average apartment will have a combined



Figure 6-10: Watson Lake and Living Area from the Control Tower

dining and living room, kitchen, two or three bedrooms, storage space and a utility room where laundry, ironing, etc., may be carried out.

The power for the detachment is supplied by diesel turbines and provides heat and electricity for all needs.

Winter at Watson Lake commences in mid-October and lasts until June. Temperatures are generally low due to the geographical location, as the detachment is surrounded by hills and mountains which afford no passage out. Therefore this particular location does not benefit by the warm chinook winds which warm certain other detachments on the route.

While Whitehorse, Teslin, Aishihik have comparatively high temperatures, Watson Lake and Snag have low temperatures. This makes Watson an ideal location for cold weather experimentation. One remarkable feature of Watson Lake climate is the extreme range of temperatures which go as low as 74°F [-59°C] below zero to as high as 80°F [27°C] above. With the higher summer temperatures come one of the worst northern bush pests, the black flies, mosquito and deer fly, particularly the former which abounds in the millions and breeds and fertilizes in every conceivable place, the leaves, the ground and the water.

SPECIAL OPERATIONS

To illustrate the scope and varied character of RCAF postwar operations in the Arctic, a number of summaries of special operations follow.

SUMMER SURVEY 1946

The following is taken from the pilot's report and deals with survey operations mainly in the districts of Ungava, Keewatin and Northern Manitoba. It is typical of this type of operation.

Ungava - 29 June 46

Weather - On the average the weather was rather poor from a navigational viewpoint on the route from Bagotville, Quebec, to Base Camp I, located at Lac Bienville 55°23'N -72°35'W. On numerous occasions the [aircraft] was flown through clouds for long periods of time with both the sky and ground obscured - no wireless aids and the usual weather forecast which have been of little value. The wind has been found to be fairly constant from west to northwest at 3000-5000 ft. although a few times after passing Corvette Lake 53°24'N 74°02'W a wind shift from NE has been noted. Ice has gone from all lakes en route but up to 27th June [1946] there was considerable ice still in the SW portion of Lac Bienville.

Navigation - The best method of navigation it has been found is by using check points and adhering closely to track. No difficulty was encountered using this method. These check points were selected for their prominent features and absence of high ground in the area. The 8 mile to inch topographical of the route are very good up to 53° 30'N but from there to BASE CAMP I are of little value.

Map Information - It would be impossible to sketch in all lakes and prominent features along the route, however a few sketches were made two of which are of lakes which make very good pin points in the unmapped area north of 53° 30'N. All information is approximate but it is felt that these places would be recognizable from the sketches.

Regarding the Egg lakes which are supposedly south of Lac Bienville there is no indication that such lakes exist. There is one fair sized body of water which could be the Egg Lakes but due to presence of numerous small islands it is impossible to be sure. Many of the lakes in the area have been found unsuitable for float and seaplane operations because of the shallowness and the number of shoal present in same.

Fort Chimo - Port Harrison - Churchill - 18 July 46

An attempt to locate the Two Brothers Islands was made again without success. A position given by the captain of the Nascopie was flown over but no islands were sighted in this area.

Mapping. Most of the route from Fort Chimo [Kuujjuaq] to Port Harrison [Inukjuak] is unmapped. Sleeper Islands in [Hudson] Bay are mapped fairly well and Farmer Island about 60 miles NW of the Sleepers is accurately mapped.

Compasses. Due to adverse weather no check on compasses was possible on the flight from Fort Chimo to Port Harrison. Compasses were checked in the vicinity of the Belcher Islands and no unusual deviations were found. All compasses were found to be out about 10° 50 miles east of Churchill.

Ice. Ice is breaking up fairly rapidly in [Hudson] Bay and the channel along the coast in the vicinity of Port Harrison now extends about 15 miles from shore.

Payne Lake - Fort Chimo - Goose Bay - 16 July 46

Mapping. With the exception of the portion of track between Leaf River and Long. 72W the route from Fort Chimo to Payne Lake is fairly well mapped. Payne Lake itself is very accurately mapped. The flight from Fort Chimo to



Figure 6-11: Airfield at Goose Bay

Goose Bay was made under very poor weather conditions so no accurate observations were possible. All flights in this area should be made with a minimum altitude of 2,000 feet as a large number of unmapped high hills were noted. Estimated height was approximately 2,000 feet.

Compasses. Deviations up to 15° were found in an area from Fort Chimo to 30 miles north. It is believed that this was caused by iron ore deposits in the area. No unusual deviations were noted in the vicinity of Payne Lake.

Ice. Payne Lake was still ice bound and it is believed that a complete break up will not take place for at least two weeks. All large lakes within a radius of 50 miles of Payne Lake were ice bound.

Ungava District - 24 July 46

Navigation. No difficulty in navigation has [occurred] in this area. Map reading has been used extensively in the eastern portion of Ungava where the mapping is good. In the western unmapped areas astro¹ and D.R.² have been the sole means of navigation. Due to very favourable weather during the past week astro has been widely used in checking map information and navigation.

Map Information. The position of Base Camp 2 south of Leaf River as found by astro is 58°28'N 70°08'W. This checks with the position found by map reading. On the map the lake is unnamed but according to information supplied at Fort Chimo its name is believed to be NEEL-OW-LO-TO-YA, which is Eskimo meaning "two legs". However the lake on which Base Camp 2 is set up has three legs. Regarding Lac Maricourt supposedly at position 56°35'N 70°55'W no lakes resembling this lake in size or shape are to be found in the vicinity.

Compasses. No unusual deviations have been experienced with any compasses with the exception of deviations in the close vicinity of Fort Chimo.

Ungava - Keewatin District - 4 August 46

Weather. On the average rather poor from a navigational viewpoint as many fronts were encountered along the routes. Terminals such as Southampton Island were many times below limits due to low stratus and fog. The majority of lakes in the Wager Bay area were still ice bound.

Mapping. In the Ungava District north of 60° latitude Canadian Topographicals are of no value however map reading is possible using American 16 miles to 1 inch topographicals. A large crater was noted at 61°18'N 73°40'W, [which] makes a very good check point. In the Southampton area

¹ Astronavigation, also known as celestial navigation, using the sun and the stars.

² Dead reckoning, referencing terrain features with maps.

mapping is very poor and in many cases even the coast line cannot be identified from the present maps. Wager Bay area is fairly well mapped on the latest Canadian Topographicals.

Compasses. Ten miles south of the Belcher Islands compasses were checked and the Fluxgate was found to be in error of 10° and the P-8 was 5°. In the Southampton Island area the compasses were found to be out as much as 15°. Wager Bay area the error in the Fluxgate was found to be as much as 15°. The P-8 fluctuated to such an extent that an accurate check was impossible.

Keewatin District - 24 August 46

Mapping. Mapping in this area is much better than in the Ungava District and map reading is possible south of Wager Bay. On the maps of Southampton Island most of the lakes are not shown but main features such as mountains and rivers are recognizable.

Due to unserviceability of the Fluxgate Compass a closer check has been made by Astro and it is now believed that the unusual deviations found during the first of August were caused by “sun spots” [occurring] at that time. No unusual deviations over 5° have been found during the past two weeks in the area covered.

Weather. Good. At Southampton Island fog was experienced whenever the wind has been from a southerly direction.

Navigation. D.R. and Astro are still the best means of navigation and map reading is possible. The position of Base Camp 3 at Baker Lake is on Christofer Island Latitude 64°N. 94°20'W.

Summary of Ungava District - 24 August 46

Mapping. South of Lat. 53°30'N. mapping is very good. North of this latitude much of the area is unmapped but the mapping is good in the few areas that have been mapped. In a few cases the coastline is inaccurate but all features are recognizable. A safe flying height is estimated to be 2,500 feet except in the south along the St. Lawrence River and in the Goose Bay region.

Compasses. Magnetic compasses are very reliable unusual deviations experienced being no more than 2 or 3°, with the exception of the close vicinity of Fort Chimo where deviations up to 10° were found. This is believed to be caused by iron ore deposits.

Weather. On the average the weather has been poor. In the western side of the area much low stratus has been blowing in off [Hudson] Bay. To the north and east during the month of August heavy fog has been found around the coast. Rainfall has not been heavy but snow has fallen as late as July 13. Ice was gone completely from all lakes by the first week in August.

Navigation. Although map reading is possible in parts of the area the best method of navigation is believed to be D.R. and [astro].

Spicer Islands - 28 August 46

Reconnaissance of the Spicer Islands was carried out successfully this date with the result that the previous position and shape as indicated on existing maps and charts are amended as shown by the accompanying [Mercator] chart and sketches. It is to be noted that the new position is based solely on D.R. Navigation and cannot be taken as truly accurate. It is quite evident however from our reconnaissance that the existing mapped position is inaccurate.

Camp I - Port Harrison - Ottawa Is. 13 July 46

Mapping. Clearwater Lake 56°10N 74°30 W outline good but islands in lake poorly mapped. Coastline of [Hudson] Bay on the 8 mile to 1 inch 1942 Belcher Island sheet is 10 miles too far west. This fact verified by Mr. Manning who surveyed the area. Mapping of islands along this coastline is accurate but like the coastline are too far west. There is a small Eskimo Camp (unmapped) at the mouth of the Langland River 57°28N 77°06W consisting of 6 tents which makes a very good pinpoint. One small island (unmapped) was sighted about 12 miles off the coast approximately 58°07N 77°55W. Two Brothers Islands on the Port Harrison sheet were not sighted and it is believed that they do not exist at least nowhere in the area they are shown in on the map. Ottawa Islands are not well mapped with the exception of Gilmour Island, Perley Island, and Eddy Island. The Ottawa Islands are about 20 miles too far east on the map in the opinion of Mr. Manning who put in a survey point on Gilmour Island. A large unmapped river was noted flowing into [Hudson] Bay from the east position of mouth 57°30N 77°13W, Richmond Gulf was visible only from a short distance due to high ground surrounding it.

Ice. Ice conditions as of 9 July - [Hudson] Bay solid ice except for a narrow channel along the coast about 3 miles in width. There is a small amount of drift ice in this channel. Majority of lakes north of Lat. 58°N are frozen solid. Lake Minto 57°20N 75°W is solid. In the south of Clearwater Lake ice is breaking up near shore.

Navigation. Due to the fact that the pilot's gyro was unserviceable and magnetic compasses were not to be relied upon, courses were steered by astro compass. However a very close check was made of ... course, and drift and track was adhered to closely. Attempts were made to use astro navigation but were not too successful due to bumpy flying conditions.

Spicer Islands Operation

Mapping. A particularly interesting flight was that which rediscovered the Spicer Islands. The following is an extract from the Log.

"0740 EST [Eastern Standard Time] 28 Aug 46, Canso "A." aircraft 11079 airborne Southampton Island (Coral Harbour) for position of Spicer Group. Crew Captain F/L Drake, JF; Co-captain F/L MacFarlane IAH; Navigator F/L Goldsmith J; Crewmen WO2 Hawke B; LAC Dugal A. Among passengers carried were B.J. Woodruff of the Dept. of Mines and Resources Geodetic Service and Dr. [Nicholas Polunin] Oxford University Botanist attached to No. 2 Photo Detachment.

"0750 EST set course for Spicer Group where it was estimated the aircraft would reach at 1038 EST.

"Weather [en route] and over group CAVU, visibility 15 miles plus. Tidal conditions at ETA - ebbing, with low tide at 10:45 hrs. EST.

"1001 EST sighted island ahead very low with several near-by reefs. Water conditions approaching island shallow with large ice packs in vicinity.

"1012 EST over a small island, approximately $\frac{3}{4}$ miles long, $\frac{1}{4}$ mile wide. Appearance base limestone with small ponds on surface. Coasts very low with sandy beaches. Vegetation nil.

"1018 EST over largest island of group. Position 68°05'N 79°10'W. Approximately 13 miles long, 6 wide. From air, island has appearance of limestone with several sandy beaches along shores which are very low. No harbours visible. Lakes and ponds numerous and shallow. Large lakes on North end of island not suitable for float or seaplane operations. Vegetation almost nil with exception of Arctic mosses.

"1020 EST carried out RECCO [reconnaissance] of most northern island, possibly 6 miles north of largest island of group. Approximately 10 miles long 6 wide, limestone composition. Many ponds and shallow lakes noted. Vegetation nil with exception of Arctic mosses.

"The island group consists of 2 large islands mentioned above and 1 small island approximately 4 miles long 2 wide. There are 3 smaller islands in the group which almost could be classed as reefs at high water.

"The islands occupy a position bounded on the north by 68°23'N, on the south by 67°84'N, on the east by 78°50'N and on the west by 79°20'W.

"Main composition of the islands is limestone with sandy and gravel shores. There are very few sandy beaches and no sheltered harbours. Average elevation of group is estimated at 25-30 feet rising to 80 feet on North end of largest island. The surface of all the islands are covered by large and small bodies of water. A few fair sized lakes were noted however none suitable for water aircraft operations in the sense of being both shallow and small.

“Vegetation on all islands almost nil with exception of many and various Arctic mosses which were noted from the air.

“Water conditions surrounding the islands were thought poor both for surface craft and water aircraft. The water being very shallow and numerous shoals being clearly visible from the air. Ice conditions were fair. Large bodies of pack ice in vicinity and many floes about. No wild life apparent from air.

“Flight was carried out at low tide for it was thought islands may have only been visible at low water. The position of group was determined by straight DR navigation and position given is only approximate. Seventy exposures were taken of group by Mr. Woodruff using a F-24 camera with 8' cone.”

EXERCISE MUSK OX

No attempt is made here to give a full report on Exercise Musk Ox. If the details are required on scientific, technical or logistics observation they may be found in the classified Canadian Army report or the RCAF report. Suffice it to narrate the purpose and route of the Exercise and the general role of the Army and the RCAF. Some mention is made of terrain features along the route.

The route was from Churchill, to Eskimo Point, to Baker Lake, to Cambridge Bay via Lake Garry and Ogden Bay; north from Cambridge to Denmark Bay, back to Cambridge, thence to Coppermine and Norman Wells; south to Fort Simpson and Fort Nelson, and from Fort Nelson along the Alaska Highway to Edmonton.

Musk Ox was a non-tactical Exercise, the main objects of which were to study:

- Army-Air Force co-operation.
- Mobility of over-snow vehicles under a wide range of winter conditions, beginning on the Barren Lands and terminating in the spring in the northwestern bush country.
- Methods of air supply, including the possibility of establishing temporary landing strips on the Barren Lands.
- Certain technical research projects in Arctic warfare.

The Exercise departed from Churchill on 15th February 1946. During the move to Baker Lake the vehicles travelled about 90 per cent of the way in the tracks of the Baker Lake party which had preceded them to establish and maintain an airstrip on the lake ice for use by the air supply unit as an alternative landing ground. This party also established a meteorological and magnetic station to supply data which was used to assist in forecasting for the main Exercise. This portion of the trek was comparatively slow due mainly to inexperience of personnel, over-heating of vehicles, and extremely bad weather.



Figure 6-12: Operations at Churchill

Of these, the overheating of vehicles continued for the duration of the Exercise, with progressive modification of cooling systems never quite rectifying the fault.

At Baker Lake the number of vehicles was reduced from 12 to 10. This was due to an increased demand on air lift caused by the initial high petrol consumption. The portion of the journey to Coppermine was over virtually uninhabited barrens and sea ice. While straight line courses were possible, the only trouble encountered was sled damage due to rock-strewn areas. At Coppermine a glider was used to bring supplies and spare parts, the tug aircraft remaining airborne and picking up (snatching) the glider when it had delivered its stores.

The next stage of the journey from Coppermine to Fort Norman was transitional. Snow became deeper and softer and the temperature took a sharp rise. Trees appeared and the Force encountered the first road through the bush after leaving Great Bear Lake. Overland from Coppermine to Great Bear Lake route-finding was assisted by an aerial reconnaissance and the maps became accurate enough to follow a planned course through hilly country.

From Fort Norman to Fort Simpson the Exercise moved along the CANOL tractor road. Snow was soft and heavy, and temperatures rose so much that night travel, with lightly loaded trailbreaking vehicles, became necessary. Engines and transmissions gave further trouble.



Figure 6-13: Musk Ox. Source: AINA photo z57e0021

Between Fort Simpson and Fort Nelson the snow disappeared and the Norseman aircraft could not be used and all supplies were dropped by parachute. Much of the trail was under flood water and to combat this an engineer party was landed by glider at the Petitot River. Streams were bridged until the Fort Nelson River was reached where it was necessary to construct a raft to ferry the vehicles.

The last stage of the Exercise was from Fort Nelson to Edmonton on the Alaska Highway. The dusty road and the lack of air filters (air filters had been removed earlier because they became clogged with snow) placed an added strain on the vehicles; therefore on arrival at Grande Prairie it was decided that continuing by road would serve no useful purpose, and the vehicles and personnel were sent by rail to Edmonton.

No. 1 Air Supply Units, under No. 9 Transport Group Headquarters, was formed in November 1945, its function being to supply the Army Moving Force of Exercise Musk [Ox] with fuel, food and replacement parts as required.

The Unit was based at aerodromes within flying range of the Moving Force at all times.

Six Dakota C.47 and three Norseman C.64 aircraft comprised the establishment.

A total of 224 RCAF personnel of various trades and ranks comprised the Unit and supplemented the Army services by supplying Chefs, [Motor Transport] personnel, Hospital staff, Clerks.

Special and standard equipment was used on the Exercise, but the amount and type was necessarily restricted to Dakota dimensions and load carrying capacity, as all equipment and personnel were transported from base to base by air.

The Main Base at Gimli, Man. was transferred to Churchill, Man. on January 6th, 1946, with Gimli remaining as a Maintenance base. All flying operations were carried out from Churchill until the Gimli Detachment moved to Yellowknife, N.W.T. on February 14th. Two Dakotas and one Norseman were then stationed at Yellowknife to lay in gasoline caches for the Moving Force and provide alternate cover on the first leg of its journey. On March 21st, the Main Base was moved to Norman Wells, N.W.T. The task of supplying the Moving Force was completed on schedule and excellent co-operation was received from the Army. Gasoline consumption of the snowmobiles was approximately 75% greater than planned which necessitated a greatly increased number of supply dropping sorties. Hadrian gliders, towed by American Dakota tugs, were employed with limited success on the last leg of the journey.

Both Army and Air Force personnel were equipped with special winter clothing.

Maintenance crews at Churchill worked in an unheated hangar on 50 and 100 hour inspections, while daily inspections and minor repairs were performed in the open. With no hangars available at Yellowknife and Norman Wells, all maintenance and servicing was performed out of doors with the help of Dakota work tents heated by Herman Nelson Heaters. One major inspection on a Dakota aircraft was performed at Yellowknife and was completed in approximately one week.

The Norman Wells Base was evacuated on April 21st and Yellowknife on April 29th with majority of personnel proceeding to Edmonton for leave and re-posting.

The Army Moving Force arrived in Edmonton on May 7th, two days behind schedule.



Map 6-2: Exercise Musk Ox: Principal Weather Stations and Communications.
Source: DHH 73/1324

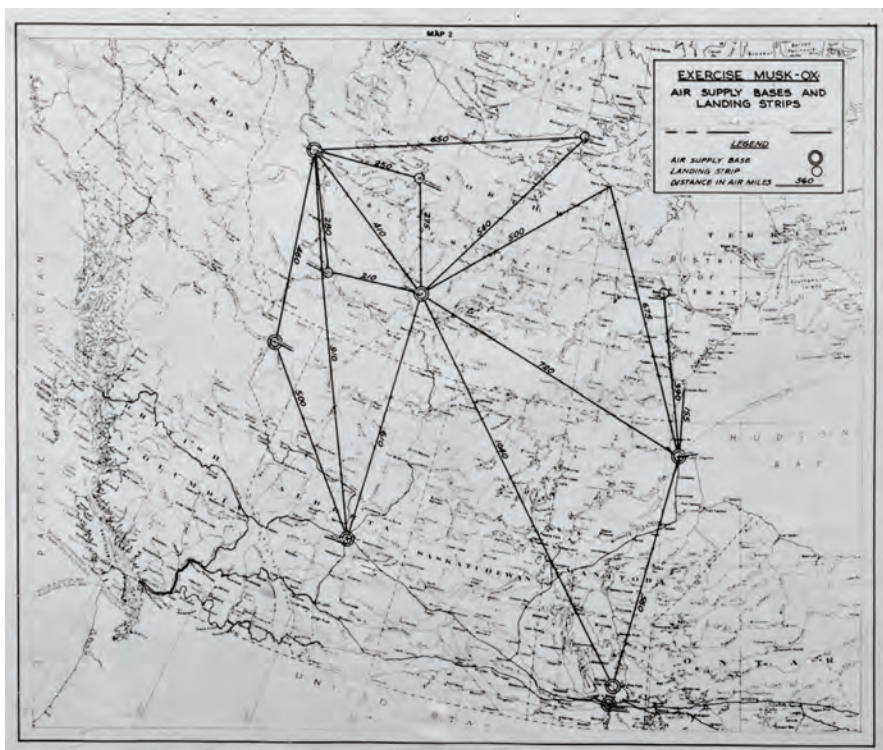
Air Supply General

During the Exercise almost all requirements of the Moving Force were supplied by air. The only exception was that portion of the trek south of Fort Nelson when a "B" Echelon travelled with the Force on the Alcan Highway.³

A total of 344,831 lbs. was supplied by air to the Force. Of this, 199,609 lbs. were dropped and the remainder was landed, either by Dakota, Norseman or glider. The daily average of air supply based on 72 days (the time taken to reach Fort Nelson) was 4,789 lbs. Dropping losses were 3.9%.

In addition to Moving Force requirements, 51,811 lbs. of supplies were flown for the Baker Lake party. Miscellaneous sorties brought the total to about 400,000 lbs. This does not include freighting to forward bases from Winnipeg and Edmonton and the moving of bases by air and extra sorties carried out at

³ Also known as the Alaska-Canadian Highway or Alaskan Highway.



Map 6-3: Exercise Musk Ox: Air Supply Bases and Landing Strips. Source: DHH 73/1324

the request of AFHQ, which brought the total weight of cargo carried by No. 1 ASU to over 800,000 lbs.

Air supply was carried out from Churchill until the Moving Force had passed Perry River. Yellowknife was an auxiliary base, except during the period of moving from Churchill to Norman Wells, during which time Yellowknife was the main base. Norman Wells closed when the Force reached Fort Simpson and future sorties were flown from either Yellowknife, Fort Nelson or Edmonton. For routes see Map 6-3.

A Norseman aircraft was kept available (on skis) within operational distance of the Force at all times; for example, at Baker Lake, Perry River, Cambridge Bay, Coppermine, Port Radium, Fort Simpson and Fort Nelson.

Dakotas on wheels landed on tractor-prepared ice strips at Baker Lake and Port Radium and on totally unprepared ice at Cambridge Bay.

Before the Exercise commenced the Force Commander prepared his anticipated air requirements for the whole expedition, giving requirement dates and commodities. It was then decided what serials could be cached ahead of the

Force. Owing to high gasoline consumption of the snowmobiles, air supply demands were increased.

Technique of Air Supply

Whenever possible, caches were laid ahead of the Force. This principle is of course thoroughly non-tactical but was done to enable aircraft to take full advantage of good weather. It was only done when there was no possibility of the Moving Force failing to locate the cache.

Parachute dropping in the early stages was done at 500 ft. and later, to reduce drift, at 300 ft. with good results, and free drops at a height of 50 to 75 ft.

The Force preferred to receive pre-arranged drops either at dawn or dusk when their vehicles were stopped for the night. At these times the light is not good for pinpointing from the air, although a number of sorties dropped were assisted by radio aids to the location.

Demands from the Force for Quartermaster, Signals, Royal Canadian Electrical and Mechanical Engineers, and medical supplies, etc., were received by the Base Commander, passed to the [Squadron Command] "Q", who warned those concerned. The requirements were delivered to Air Supply Detachment with a degree of priority for delivery. Air Supply prepared the load for delivery. The Air Liaison Officer arranged with No. 1 ASU for aircraft requirements, take-off times, etc. He also arranged with Air Supply Detachment the composition of loads, aircraft numbers, other details, and notified the Moving Force and Base Force Commander of the estimated time of arrival. Manifests were prepared for all air supply sorties.

The following are some of the articles successfully dropped:

- Chore horses
- Batteries
- Rations
- Clothing
- Eggs
- Chore horses
- Bottled liquids
- Sled runners and tow bars
- Snowmobile spare parts
- Spare parts for wireless sets
- Snowmobile tracks, wheels and suspensions
- Mail
- Photographic equipment

- Medical supplies
- Rope

Glider Operations

The CG4A Glider towed by Dakotas was not used, except for trials, until the Moving Force reached Coppermine. There one snowmobile engine was landed on the sea ice and the glider successfully lifted.

A loaded wheeled glider needs almost as good a surface on which to land as transport aircraft, but the strip required is very short. Such strips are extremely common in the Barren Lands and can be rapidly prepared by a party on the ground.

In soft snow considerable difficulty in lifting the gliders was experienced. The use of skis here would not necessarily aid the process, since skis freeze down and would destroy the braking action on which the glider largely depends for its short landing.

The workshop glider, an experiment in airborne servicing facilities, provided heavy equipment and shelter rapidly. Unfortunately, its use was confined to the latter stages of the trip when the shelter for workshop undertakings was necessary. Its limited success suggests experimentation in other types, e.g., hospital and portable radar or signal stations.



Figure 6-14: Glider on Exercise Musk Ox. Source: AINA z59e0003

Landing Strips

Due to the nature of terrain in the winter and the numerous lakes, the Force was able to pick out a landing strip for aircraft rapidly, with little or no preparation. Generally speaking, the higher the latitude the less snow cover was experienced and, therefore, less preparation was necessary.

During the early stages it seemed advisable to use the target system of dropping with a strip or “T” laid out and the pilot aiming for it. However, it was later satisfactorily proven that if the aircraft is brought over the Dropping Zone on a set course, with a visual or radio marker, the time of drop can be given from the ground. In this manner it is much easier to account for various winds. This method also saves much time, as no panels need be displayed. Night drops are the same.

Area and Type of Terrain on which Airfields were Located

Churchill is located on the edge of the barren lands on the coast of [Hudson] Bay.

Baker Lake strip was located on the frozen surface of the lake itself, 400 miles north of Churchill, in the barrens.

Cambridge Bay strip was located on the sea ice, in the bay on the south shore of Victoria Island.

Port Radium strip was located on the ice of Cameron Bay on Great Bear Lake at the Eldorado Mine.



Figure 6-15: Airfield at Churchill

Norman Wells strip was a dirt runway located in the [Mackenzie River] valley at Norman Wells.

Yellowknife strip was a gravel runway located on high level land three miles from the town of Yellowknife. In addition, Norseman landings on [skis] were made at various points along the route on the barrens and on the soft snow in the [Mackenzie] River region.

Type of Terrain over which Aircraft Operated

From Churchill to Cambridge Bay the terrain is very similar, being all in the barren lands. All sea and fresh water surfaces were frozen and appeared practically identical with the land surfaces. The country is very low lying and there is little relief. The country is completely treeless, therefore lakes are not usually apparent from the air. The only feature that can be seen are the rivers, the banks of which sometimes are apparent.

The surface is very rough being covered with hard drift. Considerable glacial drifts show through the snow, the snow cover being generally rather light. Considerable stretches of clear ice are to be seen on many of the lakes and appear to offer possibilities of easily cleared landing strips throughout the barrens.

In the Cambridge Bay - Coppermine area the country is much rougher. While still barren there is sufficient relief along the Arctic coast to make careful map reading possible by experienced personnel.

In the Port Radium area and to the south, the country is wooded and offers no particular navigational difficulties. Map reading was quite easy.

In the Yellowknife area the country is quite low but hilly and rougher than the country to the east.

In the Norman Wells area the only mountainous terrain was encountered as there are mountain ranges to a height of 5500 feet bordering the east side of the Mackenzie valley. There are much higher mountains to the west but no operations were carried out in this area.

Type of Terrain over which Snowmobiles Operated

1st leg. Rough sea ice of Hudson Bay between Churchill and Eskimo Point.

2nd leg. Eskimo Point [to] Baker Lake. Flat barren country with numerous lakes. An area of wind driven and compacted snow. Nearing Baker Lake the terrain began to take on more of a rolling character.

3rd leg. Baker Lake to Perry River. Country becomes more rolling and rugged, with hills up to 600 feet from Lake MacDougal North, to Queen Maude Gulf at Perry River.

Map 6-4: Exercise Musk Ox: Route Followed by the Moving Force. Source: DHH 73/1324



4th leg. Perry River to Cambridge Bay. Sea ice of Queen Maud Gulf very even, with approximately six inches of compact snow, slightly drifted. Bad pressure ridges to the north around Cambridge Bay and choppy ice at the mouth of the bay.

5th leg. Cambridge Bay to Coppermine. Sea ice of Coronation Gulf. Very rough and heavily drifted. Dropping and landing areas had to be hunted for.

6th leg. Coppermine to Port Radium. Rough rolling country deeply out by rivers and creeks. This area heavily covered by boulders and good sized rocks. The first sign of trees was about 5 miles N.E. of Dismal Lake. This condition caused the snow to become lightly packed and increased as the trees became thicker. Lake ice of Great Bear Lake smooth, but cut up by pressure ridges every few miles.

7th leg. Radium to Fort Norman. Moderately drifted snow on lake ice to Great Bear River then flat country cut up by the odd solitary mountain.

Type of Surface on Runways

The types of surface used by Dakotas on wheels were:

- (a) Compacted snow
- (b) Concrete partially blown clear
- (c) Cleared ice runways
- (d) Uncleared ice
- (e) Mud
- (f) Slush
- (g) Wet Gravel
- (h) Dry Gravel
- (i) Dirt

The types of surface used by Norseman on skis were:

- (a) Compacted snow
- (b) Very hard drifted snow
- (c) Ice
- (d) Slush
- (e) Soft snow

Length of Runways: Maximum - Minimum - Average

The longest runways used were 6,000ft, the shortest 4,000ft, the average being 5,000ft. Single strips were used in all cases.

Aircrew Flying Clothing

Aircrew received the full-scale issue of winter clothing supplied by the Army to all personnel on Exercise Musk Ox. The cabins of the Dakota aircraft were quite warm and flying clothing was not required. While flying, aircrew wore velanized Army battle dress,⁴ but on all flights it was stressed that aircrew must carry with them the full complement of clothing as laid down in the Army scale of issue for Exercise Musk Ox.

During February and March there was ample opportunity to check the electrically heated suits supplied by Institute of Aviation Medicine for testing. On long dropping flights (7-8 hours), electrically heated suits were worn by the airborne dropping unit personnel in the freight compartment of the Dakota aircraft.

⁴ Velanizing is a proofing process applied to uniforms to prevent snow from sticking to them.

Condition of Diet

The special northern army ration provided consisted of one and one-third regular army rations and was supposed to contain 4,500 calories per day. On several occasions a rough estimation was made of the caloric value of this daily ration served. According to the “nutrition yardstick” this ration provided not more than 3500 calories. The extra calories were probably supplied by the hard candy and chocolate which were always present on the tables.

The food received was wholesome and plentiful. No real complaints were heard about this ration as issued. All the fresh potatoes at Yellowknife were frozen. When they were cooked they became discoloured and were not very appetizing. The dehydrated foods used, i.e., apples, apricots, potatoes, eggs, milk, etc., were all very edible but of course not as tasty as the fresh article. The canned milk used at Yellowknife had become frozen and curdled when mixed with tea or coffee.

Because of the scarcity of fresh fruits and vegetables one Interservice Vitamin capsule per day was issued to each man. This capsule was taken at Yellowknife with the noonday meal. Each of these interservice vitamin capsules contains

Vitamin A.....	000 International Units
Vitamin B1.....	1.5 mgms
Vitamin C.....	50 mgms
Vitamin D	500 International Units
Riboflavin.....	3 mgms
Nicotinic Acid.....	20 mgms

Health and Serviceability of Aircrew

A high incidence of upper respiratory infections in the form of acute coryza, nasopharyngitis and influenza was encountered at Yellowknife especially during February and March. Very few aircrew, however, were grounded because of upper respiratory infections and flights were at no time delayed because of medical reasons.

A number of aircrew personnel flew 125 hours in one month. This is too much time, especially while operating for the first time over the barrens and areas which are not well mapped.

Several aircrew complained of eyestrain, especially while flying in clear weather over the barrens. The Army scale of issue for the Exercise included RCAF Type D Goggles and American Polaroid Brow Rest Goggles. These are not considered completely suitable for aircrew. No special type [was] issued to aircrew. Numerous aircrew personnel had purchased various types of spectacles, mainly Raybans. These provided fairly satisfactory protection against glare.

Possibly Raybans are not dark enough to cut out sufficient ultraviolet light, but this was never proven.

It is important to realize that eye strain and snow-blindness is just as liable to occur in the air as on the ground. It is suggested that all aircrew on long flights over the barrens should be equipped with the best types of anti-glare spectacles.

Conclusion

As the terms of reference stated that the Exercise was “to study” certain objects, it can be said that it was a success. In specific findings, however, the field was much too large to be covered in the time available and in most cases the findings serve to indicate where further study is required. Some of the findings on which, further study is required are as follows:

- a) Air supply using parachutes, gliders, and heavy and light aircraft functioned exceptionally well. Normal operating procedures were used and requirements for the Exercise were calculated very closely days prior to the sortie. There appears to be a requirement for a light aircraft for use before proper lines of communication are established.
- b) The present vehicle has the mobility required for winter operations in this country but is not completely satisfactory. A series of vehicles ranging from light reconnaissance to heavy load carriers is required before operations in all seasons will be possible. This series should have the over-snow capabilities of the present vehicle but should be floatable.
- c) The present issue clothing and equipment is adequate but not completely satisfactory.
- d) Trained personnel can, with a short training period, become capable of operating in the Arctic.
- e) The general health, nutritional state and physical fitness of personnel does not differ from normal when exposed to conditions as experienced during this Exercise.
- f) Wireless communications were very satisfactory.
- g) Scientific observations were confined to the route of the Exercise and are very sketchy due to limited time during halts.

OPERATION NANOOK 1946

The above mentioned operation while not carried out by the RCAF had in the compliment of its personnel S/L A.W. Bishop acting as an RCAF [liaison] officer. The following is a summarized version of his report.

This operation was carried out in North Greenland, the Canadian Arctic and Sub Arctic to collect and evaluate information on possibility of full scale Naval and Air Force operations in these regions and to provide training to Naval, Marine and Coast Guard personnel in these areas and collection of weather data.

Supplies and personnel to land at Thule, Greenland to establish advance weather stations and a small air strip for servicing this weather station. Naval manoeuvres were to be carried out at the Lancaster Sound - Viscount Melville Sound Areas.

Arrived Thule at 2330 hours on 21st July, remained until August 10, then proceeded to Tay Bay on the west coast of Bylot Island. During the stay at Thule, many local flights made for photographing the area also reconnaissance flights to Grant Land and Peary Land to look at the ice conditions and photographs were taken of the coastline wherever and whenever weather permitted. Reconnaissance flights to Devon Island and east above Lancaster Sound checking ice conditions. Photos were taken of south coast of Devon Island.

After completion of flights, *Norton Sound* proceeded to Tay Bay with icebreakers. Intended going into Dundas Harbour but full of ice and sailed about Lancaster Sound until August 12th when arrived at Tay Bay.

Flight proceeded 60 miles to the North Magnetic Pole, but icing conditions encountered and aircraft returned to the ship. No other attempts made in this direction and only local flights carried out along with a flight to Goose Bay.

Norton Sound proceeded to Norfolk, Va., on 29th August. S/L Bishop (the writer) then transferred to the *North Wind* and proceeded west with her on 29th August. Sailed along the north of Lancaster Sound, Barrow Strait with Viscount Melville Sound. Waters practically ice-free. Arrived at Winter Harbour on 1st September and proceeded west in McClure Strait on same evening. Entered ice pack at 1115 E.D.T. with thicknesses up to 3 or 4 ft. thick. Icebreaker *North Wind* a very sturdily constructed ship of 6800 tons. Went through the ice at 5 knots. Ice gradually became thicker and the six motors were hooked up and they proceeded at 8 knots per hour. The ice got very solid and clean to a thickness of 6 to 8 feet. This ice differed from the first as it was not as porous and was very clear. At times there were some large areas of polar pack ice up to 15 and 20 feet thick which brought them to a standstill. The vessel backed up and proceeded in a different direction, then proceeded to Winter Harbour.

On entering Barrow Strait sailed east to Thule. Anchored there for a day, left there on 10th September at 1330 hours E.D.T. Just after leaving Thule came into a field of icebergs of different sizes and shapes. Estimated there were a thousand bergs and thousands of growlers in the Melville Bay areas.

North East Coast of Bylot Island

This is a very good location where one or more airstrips could be constructed with headings in any direction. The area is roughly 20 miles long by 18 miles wide with limestone gravel and from ½ to 6 in aggregate. Some blasting would be necessary but with 3-D 8 cats, 2 carryalls, 1 grader, and 1 demolition kit TNT (not dynamite) a strip could be installed within 2 weeks. The permanent frost line is between 14 to 18 inches below the surface.

Search radar could be installed with 270° of unrestricted view to the north. Drainage could very easily be taken care of as the land slopes to the north. The beach is very good and supply ships could get to within a few hundred yards of shore where LCM [landing craft mechanized] or LCP [landing craft personnel] could transport it to the beach.

Approaches can be made from any direction with practically no trouble. This location would be suitable for either fighter or bombers and a very good possibility of subterranean hangars in cliffs immediately to the south. This applies to all locations east of 90°W.

Northwest Bylot Island is also a possible location but is not as long and more difficulty would be had in putting in an air strip.

Another possible location is on the west coast of Bylot Island about a mile south of Tay Bay. This locality is only recommended as a possible strip in the proximity of Tay Bay as it would make an excellent seaplane base. It is free of ice for about 2 months from July 30 to September 30.

Devon Island

Between Cape Home and Cape Rosamond. This is of course aggregate and sand which is bounded on the north by a cliff rising to 1200 ft. The consistence of the surface is not known as a landing was not made at this point. Although from the air it looked very much the same as northeast Bylot Island.

This location is approximately 40 miles west of Dundas Harbour, which is an excellent harbour and also could be used as a seaplane base. A small strip could also be installed on the south point of land at Dundas Harbour. Permanent frost line not known but it can be surmised that it would be in the proximity of 16".

Cape Osborne

South east coast of Devon Island. This is flat gravel and shale not nearly as good a location as Cape Rosamond and Cape Home but an airstrip could be installed with little trouble. The permanent frost line at this location is not known but can be assumed to be approximately 16-18".

Cape Leopold

Northeast coast of Somerset Island. This location was viewed from the USCGC *Whitewood* and little is known of the surface or frost line but the area is sufficiently large to erect an airstrip.

Winter Harbour

Situated on the southeast coast of Melville Island. There are several locations in this area. The possibility of constructing airstrips in this locality are excellent.

The Harbour itself is not free of ice until about the middle of August, therefore, a supply ship would have to arrive there not later than August 20, in order to allow the equipment to be put ashore and the runway completed before the 2nd week in September as it commences to get colder and the harbour becomes icebound. Cargo ships up to 6,500 tons could anchor here.

The most suitable locality found for the quick construction of an airstrip was at a point where one could be completed 4000ft by 150ft. Eight holes were dug to find out the composition of the earth in this area.

First hole - Sandy lime soil with moderate water washed aggregate. Water found at 16" but frost line not found. Assumed the water was immediately above the permafrost.

Second hole - Find sandy silt with moderate water washed aggregate. Water found at 10".

Third hole - Coarse sand and water washed aggregate from ½ to 3" about 50% sand and 50% aggregate. There was no water shelf found at this point. The permafrost was 18" below the surface.

Fourth hole - Coarse sand with 35% aggregate up to 6" with coarse sandy aggregate. There was no water found at this location with permafrost at 16".

Fifth hole - There is 6" of spongy tundra at this locality with 8" of coarse sandy aggregate underneath. No water found with permafrost at 14".

Sixth hole - There is 1" of spongy topsoil at this location with fine sand and scattered aggregate from ½" to 1". No water was found here and the permafrost was at 14".

Seventh hole - This hole was dug in a drainage bed of about 3 feet wide and 1 ½ feet deep. It consisted of rocky sandy soil with 1 to 4" aggregate with permafrost at 18".

Eighth hole - Coarse sand and sandy clay with scattered small aggregate. Water found at 12" in 4" stratum with permanent frost line at 18".

This location is suitable for the construction of an airstrip running NNW and SSE of at least 4000ft in length and 150ft wide.

General about the Area

The estimated snowfall in this area is between 8 and 10 inches. It is believed that winter maintenance of runways would not be a difficult one as the winds would keep the snow fairly well off the runways. During the latter part of June and the first part of July some difficulty might be encountered with the surface heaving if sufficient fill were not [laid].

The temperatures for this region are not known but the coldest weather experienced at Dundas Harbour was 52°F [11°C] with temperature generally around 30° to 40° [-1°C to 4°C]. During August the temperatures would vary from plus 37 to 48°F [3°C to 9°C].

Cosmic Ray

From the time the Task Force left Boston on July 8, Cosmic Ray counts were very steady and no great increases were observed until July 24 at approximately 1400 hours E.D.T. It was then noted that the count increased spasmodically to about 14 per minute. At 1420 hours E.D.T., the counts became normal until 1100 hours when the counts again started to increase to .14, at this time between 1100 and 1145 hours. The average count was 1.719 per minute.

From 1145 until 1230 hours was increased approximately 150 times. At 1207 hours all radio signals went out and a sun spot was visible through the telescope although it was not powerful enough to get much detail. Beginning at 1230, the count gradually decreased with spasmodic bursts until 1930 hours., the bursts were back to normal. At 2000 hours, the 15 and 16 MGS band became active and radio continued quite clearly until 2359 hours where again the increase in Cosmic Ray counts were up and the radio dropped off entirely. This was of very short duration, however, and at 0130 hours, July 26th Cosmic Ray counts became normal and radio increased slightly but the noise level was very high.

The Cosmic Ray counters in triple count increased 2-3000 percent between 1130 and 1300 hours with very spasmodic bursts of count rate observed. The first thought was that the counters were not working properly but all the equipment was checked and found serviceable. The triple coincident rate was thus: A quiet interval of perhaps 34 seconds then a shower of 1520 counts, then another quiet interval of a few seconds then a shower of 20-30 counts.

Shower units on single tube check gave also the indication of a change in rate of singles by bursts which were spasmodic, however a check of all single circuits showed them to be in constant operation with revolving time in the right order of magnitude.

It is felt by Mr. J.W. Graham and J.W.B. Borghausen of the Johns Hopkins University, Bureau of Ordnance and Applied Physics Lab that a definite correlation between Cosmic Rays sun spots and radio blackout are very great.

With proper recording equipment for observing Cosmic Ray counts, [radio] blackout, sunspots, Aurora's and the magnetic fields of both earth and sun the information gathered could be of great use. With any repetition of events which took place on the 24th and 25th July, the period of warning before radio blackouts could be used advantageously by an Armed Force in not only this but in other regions, and with research [could] develop radio aids to partially overcome this phenomena.

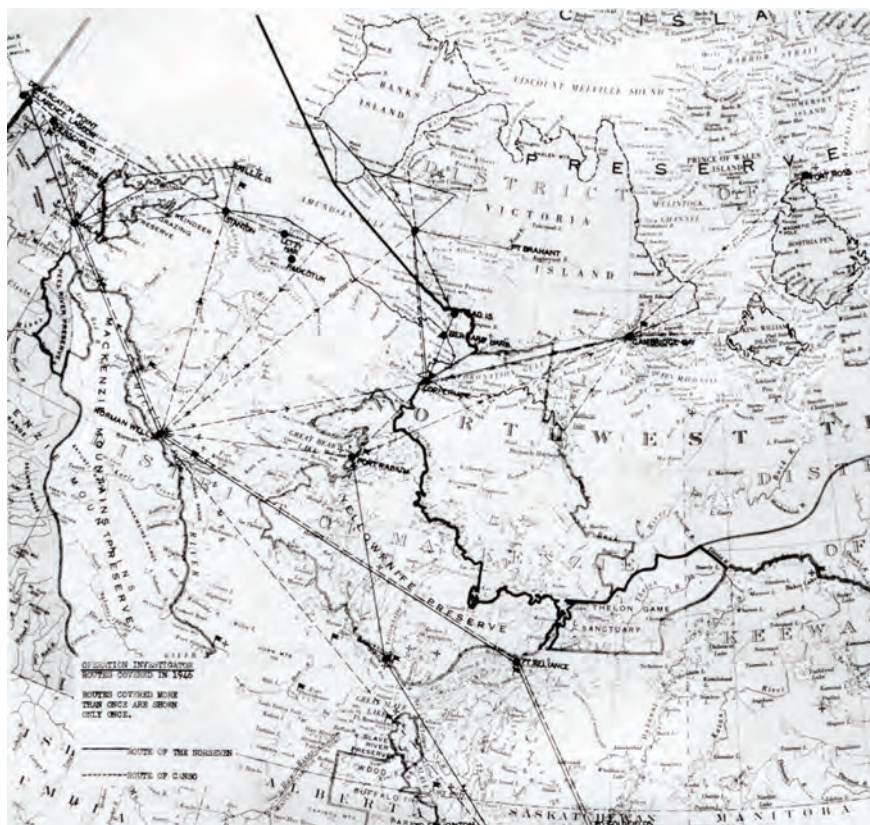
OPERATION INVESTIGATOR 1946

This operation was organized for the purpose of locating, examining and reporting on suitable air bases for float and ski operation in the Northwest Territories and Western Arctic; to consider these bases from the standpoint of future development of landing strips, camp sites and radio aides; and to establish at selected points, aviation fuel caches which will permit subsequent freedom of movement for aircraft.

Ice Conditions

Ice conditions are a very important factor when carrying out any sea-borne or airborne operations in the Arctic. Protection from drifting ice is one of the main considerations when selecting a base for float plane or flying boat operations. Experienced captains of ships operating in the Western Arctic agree that seaborne operations are very hazardous if carried out before early August or continued beyond the middle of September. There is always the possibility of being trapped by polar pack ice and either crushed or immobilized for long periods. The ideal float or flying boat base should have protection from drifting ice and could be either a large lake in which the ice is known to melt out quickly in the spring, a land locked harbour or the mouth of a large stream. The greatest factor in clearing the ice from a lake or harbour is the presence of rivers or streams. The spring run off of relatively warm water rapidly melts the ice and the current gradually forces the loose ice out and keeps it away.

Due to the spring run off of warmer water down the Mackenzie River, Aklavik was clear of ice and ready for flying boat operations by late June. Liverpool Bay at the mouth of the Anderson River was also clear and Copper mine River was ready for operations early in July. An important factor in selecting a lake for a base is that the lake should be as shallow as possible consistent with the type of flying boat to be used. The combination of shallow



Map 6-5: 1946 Operation Investigator

water with one or more streams carrying in warm water melts out the ice weeks ahead of that in many large deep lakes.

On the 3rd of July it was observed that Clarence Lagoon $69^{\circ}37'N$ $140^{\circ}47'W$ was clear of ice although the other lakes and bays in the area were solidly frozen. Later investigations revealed that the water was from seven to eight feet deep and several good sized streams flowed into the lagoon.

In aircraft operations protection from the ice must be a prime consideration. In a few hours drift ice can move in to prevent take off and seriously damage the aircraft. If there is any ice in the vicinity and the harbour or bay being used is open, an alert guard must be posted at all times and the winds and tide carefully checked. The experience of the Norsemen at Holman Island where they were grounded by drift ice for sixteen days is of considerable value.

Meteorological Conditions

Summer temperatures were invariably much lower on the Arctic Islands as compared with the Arctic mainland and generally range between 38°F [3°C] to 50°F [10°C] during the day, falling to close to the freezing point during the short night period at the end of August.

Weather in the vicinity of large areas of ice or cold water has been observed to change with unbelievable rapidity. A wind switch on one occasion caused a drop of forty degrees F in less than an hour with considerable fog formation.

The cooling effect on the air masses by the large areas of ice and cold water causes rapid changes from conditions of clear visibility to fog and low cloud. This condition generally does not extend over large areas and aircraft with sufficient range should have no difficulty in finding a suitable alternate within a two hundred mile radius.

Very little precipitation was encountered. It is reported the snow fall is very light in the Western Arctic during the winter and the blowing snow condition which is notorious around Churchill seldom exists.

Late afternoons and evenings were noted as bringing the best ceilings and visibility.

Considerable up slope fog and low cloud have been observed at Holman Island, the north coast of Victoria Island and other areas where there are high hills or bluffs.

The spread between temperature and dew point is generally very small.

Weather Reports

Reporting stations are few and scattered in the Western Arctic and during the summer adverse atmospheric conditions caused poor or nil radio reception, preventing transmission of weather reports from isolated reporting stations.

If special reports were required from a specific reporting station, usually a radio schedule had to be arranged many hours ahead of time.

Holman Island weather reporting station was operated by the RCAF, due to the summer holiday departure of the Hudson[s] Bay Post Manager who usually operates the Station.

Reports from this station were of great value as it was the most northerly reporting point and often the source of, or first reported indication of deteriorating weather.

Local fog conditions at Holman Island were misleading at times and it is not considered a good site for a weather reporting station.

A weather reporting station in the northern part of Banks or Victoria or on Melville Island would be invaluable in forecasting the weather.

Synoptic forecasts would be useful if they could be obtained promptly from Edmonton.

Fort Ross and Churchill reports were difficult to obtain, mostly by reason of poor radio reception.

A weather reporting station on King William Island would be of great value as there is no coverage in this area.

Maps and Charts

Both the Air Navigation Edition, eight miles to the inch; and the American Regional Aeronautical Charts, sixteen miles to the inch, were used.

These maps were very inaccurate or showed many large areas as unexplored. Such failings were anticipated and no major difficulty was experienced in keeping properly oriented.

Admiralty charts No. 21108 are a good source of information in regards to obstructions and hazards to ships and depths of water at known harbours and bays and along the main shipping channels and coastal waters.

Pilots and Navigators planning flights in the Arctic are advised to believe their maps with reserve and be prepared for many errors and lack of detail.

Every effort was made to effect accurate corrections to the maps, but this is difficult without celestial observations or other positive fixes or prolonged circling at the area, either of which was generally not possible. All map corrections made will be reviewed and forwarded through Air Forces channels.

Eskimos have their own names for islands, lakes, etc. The Eskimo [Inuktitut] names are descriptive i.e. Aklavik – “Place of the Black Bear”. This should be remembered when questioning Eskimos regarding geographical information.

Radio

Radio facilities are very meagre in the Western Arctic and consist of stations operated by:

- Royal Canadian Corps of Signals at Aklavik,
- Department of Transport at Coppermine,
- RCM Police Schooner *St. Roch* at Cambridge Bay (now en route to Vancouver), and
- Hudson's Bay Company Trading Posts.

All stations operate on regular schedules for the purpose of passing weather reports, business and personal messages.

Usually radio reception is very good along and north of the coast. During July, atmospheric disturbances caused very poor or nil reception; on one occasion this condition lasting for ten days.

Numerous fade out spots were encountered in the vicinity of Goldfields, Yellowknife, Coppermine and on Banks and Victoria Islands probably due to the presence of ore bodies.

The five to six Megacycle Band was the most satisfactory for both transmitting and receiving.

Continuous Wave [propagation] is necessary for [consistent] results.

Health and Morale

No major illness or accidental injury [occurred] and other than a few mild cases of [dysentery] and head colds the health of the personnel was good.

It was noted that when the Unit visited an isolated post, although no crew member suffered from a cold, the visit usually caused an epidemic of colds among the local inhabitants. The Eskimos have very little resistance to common colds and it is always serious and often fatal to them. If possible, efforts should be made to nullify this effect; in any case medical supplies should be carried to help combat epidemics that the visit may cause. Personnel suffering from any form of cold or other infectious diseases should not be allowed to visit any isolated post and should be quarantined as much as possible. In particular they should not be allowed to come in contact with any Eskimos.

In the selection of personnel for operations of this nature, a desirable qualification would be that the individual should be experienced in, and enjoy, the outdoor type of life.

In this operation, the personnel have been confronted with a myriad variety of duties making and breaking camp, cooking, aircraft maintenance, etc., and most have been on duty every day for long hours. It is submitted that special leave consideration should be given as a fair compensation for the loss of normal forty eight⁵ and weekend leave and the separation from families.

Clothing

Generally speaking, Air Force issue clothing is suitable for summer operations in the Arctic. A few changes could be made to increase the comfort and efficiency of several of the items.

It appears to be the opinion of many persons that old, partly worn clothing and shoes are all that is required for use in the Arctic that the individuals will be more or less informally roughing it, and no one of any importance will see or criticize them for being sloppy.

Clothing and food are the two main considerations for good health and efficiency and in cases of emergency for survival.

⁵ A standard 48-hour work week.

Clothing and foot wear should be the best and most suitable [that is] obtainable, and emergencies should always be considered.

Suitable clothing should always be carried for protection no matter how warm and balmy it may be at the base. The Arctic is noted for violent and sudden changes, temperatures will drop to freezing very rapidly and storm conditions can cause isolation and hardship if you are not prepared. Eskimos are never separated from their parkas and other suitable clothing.

The ideal parka should be modelled after the Eskimo style garment. Fit correctly but loosely. They are made up of two garments. The outer shell of a good grade drill or grenfell cloth and an inner shell of duffle or stroud material. It should extend almost to the knees and have a properly fitted hood with fringe of wolverine or wolf fur. No zipper or buttons are required, the garment to be pulled on over the head. Two deep slash pockets are desirable.

The Parka is the most useful article of outer clothing obtainable and should never be left at home even on the warmest days. It is recommended a good parka to the above mentioned specifications be issued every member of an Arctic Operation.

Game

Game is a matter of the greatest importance to the life of the inhabitants of the Arctic, either Eskimo or white man. The Eskimo is obliged to live where there is game as it is his main food supply and the caribou skins are his only source of suitable clothing for the winter.

The white man, of course, lives on and trades for the efforts of the Eskimos, namely furs.

The question of game can be of vital concern for the personnel of an operation or expedition in the event of an emergency and presence of game should be closely observed at all times.

The proper equipment and information on the correct technique for hunting and fishing in the Arctic should be available and whenever possible, experience should be obtained first hand on how to use the equipment to the best advantage.

The best possible experience would be to make a hunting or fishing trip with an experienced and capable Eskimo guide, and actually use the equipment provided. The average outdoor type, who enjoys hunting or fishing will rapidly pick up the necessary knowledge and be a valuable asset to the expedition.

The majority of white men traders, etc., can talk a good hunt, but the Eskimo makes his living at it and can usually provide the best guidance. Even if he cannot speak English, his technique and methods can be followed.

Game is fairly plentiful and its possible to live off the country if you have the equipment and knowledge. Fish are plentiful and can be caught in large quantities by using nets preferably placed at the mouth of a stream or at a narrow channel. Three and one half inch mesh seems to be universally used, and if a net and stream are available, a good supply of fish can be obtained. These can be filleted and dried in the sun or frozen, depending on the season.

A natural ice box for storage can be obtained by digging anywhere for a depth of about two feet to encounter the Permanent frost.⁶

Water fowl can be obtained in season or their eggs may also be gathered. Ptarmigan are fairly plentiful and can sometimes be obtained with a stick or by throwing rocks.

Seals are plentiful but it requires considerable experience and skill to successfully hunt them.

Caribou are the best source of food and their skins will make suitable clothing and tents. They are present in nearly all parts of the Arctic mainland, and on Banks and Victoria Islands. The main caribou herd of an estimated 100,000 head was observed some forty miles west of Bathurst Inlet on the 14th of July, this herd migrates continually and is reported to always travel into the wind. Their geographic location would thus be as predictable as the wind. Smaller herds are generally present in most districts and are usually in the more fertile valleys. They are described as easy to stalk and kill, and are very good eating.

Muskox are reported plentiful on Melville Island and a herd of twenty was observed east of Coppermine, at 67°42N 111°25W on the 18th of August. They are reported very easy to stalk and kill as they have little fear of man. They are protected by law and must not be killed except in an emergency.

Eskimos

Eskimos were friendly and co-operative, always willing to lend a hand, especially in an emergency. The average Eskimo is generally very practical and appears to be inherently mechanically inclined with a natural aptitude for handling boats, engines, etc.; and they quickly and accurately sense the correct procedure and requirements for handling and beaching aircraft.

They are generous in lending their boats and other valuable equipment and care has been taken to always offer remuneration of some kind. They greatly appreciate the gift of some personal object such as sunglasses, cigarette lighters, tools, etc.

⁶ Rock, sediment, and soil that is frozen for more than two years.

The Eskimos have many fine moral attributes and codes and are strictly honest: "if anything has been lost, don't waste time with the Eskimos, search the nearest white man."

The Eskimos have been obviously exploited and neglected; the only free gift from the white man being his social and communicable diseases against which the Eskimo has little resistance.

The general effect of introducing the doubtful virtues and values of civilization has been to confuse him in respect to religion; undermine his health by introducing white man's unsuitable clothing and food; kill him off with the white man's many and varied diseases; and encourage him to spend all his time hunting foxes so he can trade for items which he doesn't need and without which he would be better off. In spite of all this they are very desirable Canadians and are happy and sociable and always ready to share their possessions whatever they may be.

It is the policy of the RCAF to always help the Eskimos, to feed them when they are starving, give medical attention when they are ill or be authorized to transport them to hospitals when necessary. All operations should be briefed to keep relations with them on a high level and help them in every way possible. It is considered that the good will and co-operation of the Eskimos would be a



Figure 6-16: Inuk with dog team. Source: AINA z57e0033

valuable asset to the RCAF in particular, and Canada in general, in any operations which may take place in the Arctic.

During the period of duty at Coppermine, members of the operation were summoned for jury duty at the trial of an Eskimo woman for murder. The field commander as foreman of the jury was able to announce a verdict of not guilty. This had a profound effect on the native population. In their minds the airmen are now great people as the great judge from outside and the high officials of the police had attempted to hang an Eskimo and the airman had merely said not guilty and that was the end of the affair.

During the reign of [Operation] Muskox, the average Eskimo's first contact with the RCAF, they had become accustomed to see each RCAF aircraft rain down all sorts of desirable equipment, food, gasoline "worth \$2.00 a gallon," silk parachutes, etc., all for free, if it were missed or abandoned by the moving force. They live in hopes of a similar happy event.

Water Depth Determination

It is very difficult to accurately determine the depth of the water from the air either under conditions of clear glassy water or if the water is agitated or opaque. This made landing on unknown water a hazardous undertaking.

A device was made up in the field to measure the depth of the water. This device consisted of a bright float, a predetermined length of stout cord, and a weight sufficiently heavy enough to submerge the float.

The principle of operation was as follows: if ten feet of water was desired the float would be attached to the weight with ten feet of the cord. The apparatus was then carefully dropped into the desired area of water from a low altitude at the lowest air speed possible. If the float sank out of sight or could be observed below the surface, it could be reasonably assumed the water was at least ten feet deep and safe for a landing.

This device worked, but refinements could be made: for example, more than one float could be spaced along the cord at known intervals. This would provide a more accurate measurement of the depth. A water stain could be added which would make the device more visible. If a considerable number were dropped in the water area concerned, an accurate estimation over an area sufficiently large enough for an aircraft to land in could be made, thus eliminating the risk of landing in shallow water. It would be possible to later salvage the devices.

Tides

Tides at all points visited did not exceed two feet, however even this small amount could leave a beached aircraft marooned for many hours. The condition

of the tides can be accurately estimated by observing the water marks on the beach or rocks. It is reported that tides west of Boothia do not exceed two feet.

Aerodrome Sites

Aerodrome sites with unlimited possibilities have been observed in every area visited. Although there is considerable rocky and rugged terrain, comparatively little distance has to be travelled before locating a level area suitable for a large aerodrome.

Surface specifications varied. There are many large areas composed of tundra, which is a mixture of moss, light soil, roots, etc., and acts as an insulation for the permanent frost which is never more than two feet below the surface. The tundra is usually almost smooth enough for wheel landings, but there are many small pot holes, slight depression hummocks, etc., which require levelling or filling in.

This would appear to be a very simple operation, but to disturb this insulation allows the sun and heat to reach the frost causing uneven melting resulting in a soft mush surface unsafe for aircraft use. By preserving the insulation value of the tundra and adding filling, in the form of gravel to all uneven or spongy areas, a good solid surface can be obtained.

This problem has been discussed with engineers at Norman Wells who have had considerable experience with building roads in permanent frost country, they were unanimous in stating the insulation value should not be destroyed and it was sound practice to always build up with good aggregate.

Level sandy silt areas were also available, usually at the mouth of rivers. This type of surface is inclined to be soft for heavy aircraft except when frozen and would require a stiffener of coarse gravel. Soft shale and limestone are another type of surface, which could be worked with bulldozer and rolled flat.

Many old beaches were noticed mostly in level areas near the coast and on islands where it would appear to be a simple matter to build a runway. They are usually miles long and consist of sand and gravel.

In general, aerodromes or landing strips could be constructed in any area desired, usually very little work being required. A trained engineering crew with proper equipment could construct many good fields during the short navigation season, considering that the continuous daylight would allow uninterrupted work.

Snow fall is very light in the Western Arctic and snow removal would not be a problem. During the winter months, natives report many wind swept ice areas are suitable for wheel landings by heavy aircraft. This fact is worth consideration as a suitable time to move in heavy equipment or supplies.

The position and a short description of some natural seaplane bases, aerodrome and camp sites are given below. Reconnaissance reports also include general remarks on sites.

Clarence Lagoon

69°37'N 140°47'W 191. The terrain is level gravelly tundra; with unlimited approaches from the east, west and north. There are mountains to 3,000 feet, five miles south. A good seaplane base and camp site easily accessible from the sea.

Paulatuk

69°24'N 124°W 192. Very extensive level gravelly tundra terrain, with unlimited approaches from the north, east and west. Mountains to 1,000 feet, five miles south. Good seaplane base and camp site.

Souths Bay

68°58'N 115°50'W (Approx) 193. A large level area suitable for an aerodrome located here. Terrain is gravelly old beach areas and tundra. Unlimited approaches from all directions. Large lake, more than two miles long, suitable for seaplanes situated between Stapylton and Union Bays.

Coppermine

67°49'N 115°05'W 194. No large level areas at Coppermine, but many suitable level tundra aerodrome sites in the vicinity. One landing strip 3,600 feet long has been laid out and marked by flags on an island at the mouth of the Coppermine River.

Mackenzie Delta

69°24'N 126°W 195. Most of the islands north of Aklavik are suitable for aerodromes. The soil is a light sandy loam. The delta is very level and approaches are clear up to 25 miles. Many good seaplane bases and camp sites in the area. Country is easily accessible down the Mackenzie River.

Bathurst Inlet

69°50'N 108°02'W 196. There are many level sandy and tundra areas suitable for the construction of aerodromes, but the location [which is] in a valley would cause restrictions on some approaches. Mountains are 1,000 feet in height and valley is about eight miles long. Outstanding camp site with a good seaplane base on the lake south of the village.

Victoria Island

197. Level aerodrome site consisting of five square miles of smooth sand at the south end of Richard Collinson Inlet. Also many good sites along the east and south coast, consisting of large level areas of gravelly tundra and old beaches.

King William Island

69°N 98°W 198. Many suitable locations for aerodromes located on this island. There is no high ground on the island. Surface consists of level gravelly tundra areas with many old beaches. Approaches would be unlimited for over fifty miles. Several good locations for seaplane bases and unlimited good camp sites.

Paisley Bay

70°35'N 96°20'W 199. A level gravelly tundra area with clear approaches from the west. Considered the best aerodrome site, seaplane base and camp site on the west side of Boothia Peninsula.

Boothia Peninsula East Coast

70°45'N to 71°45'N 200. Terrain is very level tundra with a great many old beaches. Clear approaches for 25 miles. Water is quite shallow along the coast.

Banks Island

Suitable camp site, aerodrome and seaplane bases located at De Salis Bay 71°29'N 121°45'W and at Sachs Harbour 72°05'N 125°W. The interior and northeast part of the island is level to gentle rolling gravelly tundra and old beaches with many large lakes suitable for flying boats.

GENERAL GEOGRAPHICAL OBSERVATIONS ON INVESTIGATOR FLIGHTS

Coppermine via the Coast to Bathurst Inlet - 13th July 1946.

The coast line is fairly rugged with high bluffs, rocky and rolling tundra. Many of the bays are shallow in spots, are rocky, or have boulder strewn beaches. The best of the bays appeared to be Fort Epworth, Grays Bay, Inman Harbour, Detention Harbour and Danial Moore Bay.

Many have considerable ice in them as yet and would have to be used with caution in respect to shoals, rocks, rough beaches, etc. (Fort Epworth being the only one entirely free of ice). This is probably due to the spring run off of

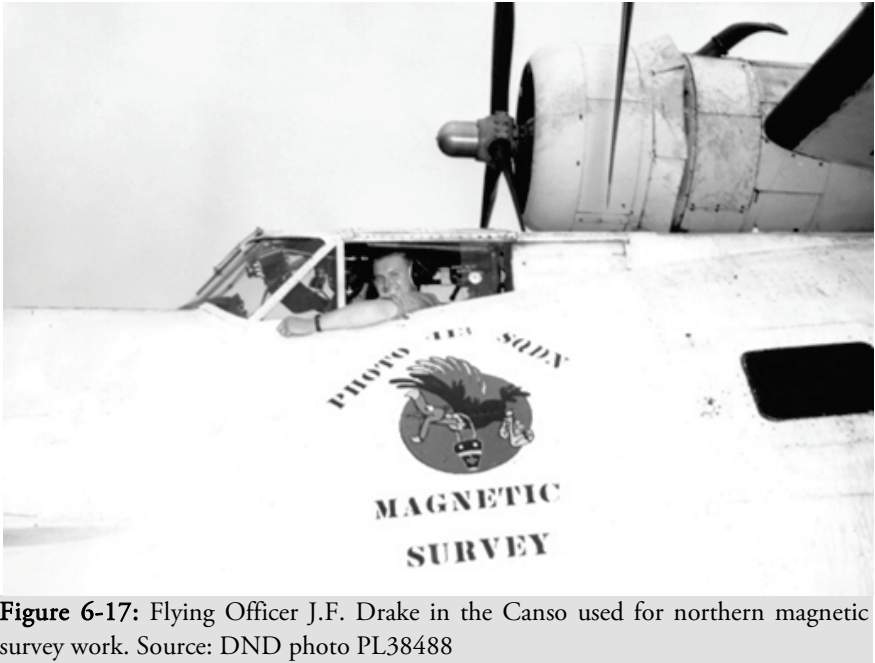


Figure 6-17: Flying Officer J.F. Drake in the Canso used for northern magnetic survey work. Source: DND photo PL38488

warmer water and current from Tree River. In general, any bay which has a fair sized stream running into it appears to clear of ice earlier and remain clear due to the current. The ice as yet has not moved much in Coronation Gulf and Bathurst Inlet. Many areas were not solid but had considerable ice in them and would be unsafe for landings.

The terrain direct from Bathurst Inlet to Coppermine is rugged with rock ridges and bluffs and tundra valleys, many lakes and streams. Maps do not have sufficient accurate detail for pilotage by map reading alone. Landed at Coppermine 0615 hours on Sunday, 14 July 1946.

Coppermine to Holman via Bernard Harbour - 16th July 1946.

The beaches at Cape Hearne are strewn with large boulders and are generally unsafe for beaching. Basil Bay has deep water, good shelter and good beaches on the south shore. Locker Point to Bernard Harbour is a very exposed and shallow coastline. Inland west of the coast, the country is rolling tundra with innumerable lakes and streams. Many old gravelly beaches were seen. Very little game observed, no caribou reported in this area. Unable to land at Bernard Harbour due to ice conditions.

Prince Albert Sound [is] full of winter ice, south shore has bare sand knolls and good sand beaches. Water off shore appears very deep. Most of the islands

on the north side of the Sound are improperly shown on the map. Landed at Holman Island at 1125 hours. The Base is called Holman Island but is really on the mainland at Kings Bay. It has a fairly good harbour, deep water, rocky beach but is fairly small and subject to ice conditions when the wind is from the southerly or easterly quadrants.

A large lake about three miles north is used for landings when the bay is unsafe. A large level area west of Kings Bay was inspected, it has possibilities for two strips of 4,000 feet with good approaches and unlimited soft crushed rock available for runways.

Coppermine to Cambridge via South Coast Victoria Island - 18th July 1946.

Islands of the Duke of York Archipelago are very rocky with high bluffs. South west corner of Victoria Island, rolling tundra with low rocky ridges, beaches generally sandy with many areas boulder strewn and the water appears very deep a few feet from shore. A series of small open bays and many small lakes and ponds. Bay at Rose Point 68°35'N 111°40'W, considerable ice, very deep but good shelter and beaches. A few boulders. Lakes in this area are still full of ice. One native tent close to the shore. The country is still rolling tundra low rocky ridges, many lakes and ponds. Larger lakes are still ice bound. Several natural level areas near 68°40'N 108°30'W.

Lauchlin River very shallow with sand bars at the entrance. Byron Bay deep in the centre but sandy shoals near the river mouth. Beaches sandy with many small boulders. A level area of tundra two miles long at 69°01'N 108°30'W.

Wellington Bay appears deep, sand shoals near the shores, especially at the river mouth, sand beaches, some boulders. Bay at 69°25'N 105°30'W, frozen over, appears to be deep, shallow in some areas near the shore, some islands. Beach sandy with boulders. Entrance to Wellington Bay is very shallow. There were native camps at both ends of the channel. Bay at 69°14'N 105°20'W mostly frozen over, appears deep with rocky shores. Area is rolling tundra with many lakes and ponds.

Coronation Gulf and Dease Strait are full of ice with very few pressure cracks.

The R.C.M.P. boat *St. Roch* was observed at Cambridge Bay having wintered there. Also the sunken hulk of the *Bay Maud*. Photographs were taken of Cambridge Bay Area. Aircraft landed at 1245 hours.

The coastline south side of Dease Strait unbroken by bays, fair beaches with a few boulders and appears to be fairly deep just off shore. The country is rolling tundra with many small lakes and ponds. Several areas of the coast from 107°W to Cape Flinders have shoals near the shore with boulder strewn beaches. Several islands not shown on the map north west of Cape Flinders.

Passed over Wilmot Islands and trading post belonging to Patsy Klengenberg. Area between the islands was open and plenty of room for safe landings. Appeared to be fair shelter and beaches but low clouds in this area and clear observations not possible. Chapman Islands low lying, gravel and tundra, boulder beaches, deep water close to the shore. Considerable low clouds along the coast from Point Barrow to Coppermine. Landed at Coppermine 2255 hours, 18th July.

Coppermine - Holman Isand - Coast Banks Isand - Prince of Wales Strait - 28th July 1946.

Special attention was paid the terrain around Stapylton Bay, Souths Bay and the large lake between these two bays. This lake is over two miles long and close to a mile wide. It is fairly deep, good shelter and beaches and was clear of ice, considered a very good emergency landing lake for flying boats.

The area around Souths Bay is almost entirely old gravel beaches and no high ground for over fifty miles in all directions.

Dolphin and Union Strait were full of loose ice. This ice was not thick enough to prevent passage of large ships but would be unsafe for use by aircraft.

Prince Albert Sound full of loose ice. Holman Island obscured by fog. Considerable new snow at 71°N in the vicinity of Cape Woolaston. Part of Minto Inlet could be seen through low cloud and fog and was full of ice. Over Banks Island just north of De Salis Bay, this bay appeared suitable for a combination seaplane aerodrome base.

The coast north east of De Salis has a high bluff of from fifty to a hundred feet, appears to be quite shallow close to shore as there was much grounded ice all along the beach. The country inland was rolling tundra with many deep stream beds most of which were dry. Also many shallow lakes. The country immediately around De Salis Bay is quite level and is the beginning of a valley which runs west into the interior. South of De Salis the terrain becomes very rugged with a high rock bluff straight up from the sea to a maximum of 1,000ft. This is typical of the whole south coast of the island from Nelson Head to Cape Lampton and also up the west side to about 71°30'N where there is a smooth beach about two miles long.

The coast line becomes more level with a low bluff along the shore and then level until the high bluff about five miles from shore at 71°45'N. Lake about two miles square at 71°45'N entirely free of ice and appeared quite deep. No ice seen around the south coast and so far up the west side. Any of the hills over 500ft high had considerable snow on them.

The plain along the shore extended more inland as one proceeded north, the hills were more than ten miles from shore and there were many level areas and

lakes up to three miles long; several being entirely clear of ice. The harbour is an ideal size with deep water, good shelter and beaches; several buildings and quite a few tents.

Inland the terrain is rolling tundra with many lakes, streams and swampy areas. Appears quite fertile and comparatively pleasant country. One of the main breeding grounds for white wavy geese and thousands were seen.

Many small herds of caribou were also observed. They were well scattered over the north part of the island. Several large lakes at about 72°40'N 120°W. Solid ice in the Prince of Wales Strait and considerable fog along the east coast of Banks Island.

Turning north at the Princess Royal Islands, Knight Harbour which had been reported as suitable for use by aircraft is noted as being very open to the east, no protection from ice conditions which are always dangerous in this area or from the easterly winds. Very shallow near the shore with poor beaches. Definitely unsuitable for use by aircraft.

Russel Point at 73°30'N 115°10'W is very level and sandy. Many small streams, but a landing strip could be constructed here with very little labour, approaches are clear in all directions.

McClure Strait and Viscount Melville Sound frozen over as far as could be seen; many large sections of glacier ice. Proceeding south along the west coast of Victoria Island, Prince Albert Peninsula, rugged with rock ridges and tundra valleys, many lakes and streams.

Walker and Jago Bays full of winter ice. They appear to be suitable for seaplane work when the ice clears. Water looks deep with good shelter and beaches. Fish Bay frozen over. Shelter very poor here and no protection from ice. Large lake about two miles long just north of Fish Bay. This lake is clear of ice. Appears deep enough for use by flying boats. Has good shelter and beaches and fair approaches. Lake is not shown on the map.

Port Radium - Bathurst Inlet - Cambridge Bay - 2nd Aug 1946.

Shore line in the vicinity of Port Radium is very rugged and rocky with many deep sheltered bays.

From 115°W east at 66°30'N, it is barren to the Coppermine River. There are a few trees along the river. Area east of the Coppermine River is rocky and barren with many lakes and streams most of the lakes being frozen over. One very large lake noted; believed to be Lake Tukiohuk not correctly shown on the map as to size and shape. A few small herds of caribou sighted here. There is insufficient detail on the map for accurate navigation by map reading alone.

Bathurst Inlet has many good bays with deep water, good beaches and shelter. The long bay extending west at Burnside Harbour being considered the

most suitable for large flying boats. Most of the bays on the east side of Bathurst Inlet notably Fowler and Gordon Bays appear too deep for anchorage. The terrain on the east side of Bathurst Inlet is very rugged with rock ridges many small lakes and tundra. Bathurst Inlet was fairly clear of ice; some extensive loose ice at the entrance.

King William Island and Boothia Peninsula - 6th Aug 1946.

The southeast area of Victoria Island between Cambridge Bay and Stromness Bay consists of about half rolling tundra and lakes and streams. Some of the lakes are more than three miles long and appear to be more than ten (10) feet deep; they were clear of ice. Very hard to accurately judge the depth of this clear water.

Stromness Bay. Very good safe harbour with islands and sand bars at the entrance making it free of ice in spite of a strong east wind. Appears more than ten feet deep in the centre and nearly three miles long, good shelter and beaches. A shack located on one of the islands at the entrance to the bay. Fresh water stream at the northwest end; very little ice in the bay, not enough to prevent its use by aircraft.

Jenny Lind Island. Rolling gravelly tundra with many small lakes and streams. One bay on the south side too open to be useful. A lake over two miles long located at the south end, lake was clear of ice and appeared suitable for aircraft use. Many long gravel ridges on this island; they appear to be old beaches.

Royal Geographical Society (R.G.S) Islands. Many small gravelly islands and shoals off the south end of the main island. Large, level light clay or sand area on the west side about three miles by two miles. The north island in this group is almost entirely level sand or light clay. Captain Larsen of the *St. Roch* who has visited these islands in the winter, states it is hard, very level clay surface and believes an aircraft could land on it anywhere. It appears very level and free from obstructions from the air. No good harbour around these islands, water is deep and the sandy beaches look very good. These islands are located farther north as shown on the maps and are not accurate as regards size, shape or relative position. Some haze and fog here prevented a clear orientation of their size and relative positions.

Canadian Geographical Society (C.G.S.) Islands. This island does not exist as shown on the map but could be a much smaller island than shown and located close to the R.G.S. group.

Queen [Maud] Gulf and Victoria Straits. Full of nearly solid winter ice as far as could be seen. However, the very strong east wind of over 30 miles per hour appeared to be moving it slightly.

King William Island. Graham Gore Peninsula very gravelly, rolling tundra with many lakes and streams. Very shallow shore. Little vegetation evident here.

Bay at Cape Francis Crozier. The only sheltered bay in the area free of ice. Shallow near the shore and appeared to be about ten feet deep near the centre.

Terror Bay. About two-thirds frozen over. Some of the smaller bays and coves and one long bay on the east side behind a sandpit were open enough to be used by the Canso. House and warehouse at 68°57'N 98°05'W. They belong to Patsy Klengenberg⁷ who is settling up a camp there for next winter. Appears to be a good harbour with deep water, good shelter and beaches. A good size for flying boats. Several streams empty in the bay which will assist in keeping the ice out and ensure fresh water and a supply of fish which in turn attract the seals.

Washington Bay. Frozen over except near the east shore. This bay is larger than Terror Bay, but has more obstructions in it, islands and sand bars, etc., has no large streams emptying into it. It has several over a mile long sandpits and good beaches. Area is gently rolling tundra with many old gravelly beaches and ridges several miles long.

Adelaide Peninsula and King William Island. As far as can be seen (50 plus miles) gently rolling tundra and many lakes and streams. No high ground.

⁷ Editor's note: Born on the north coast of Alaska in 1904, Patsy Klengenberg was the oldest son of Christian Klengenberg, a Danish sailor, and Gremnia, an Alaskan Eskimo. In 1910 the Klengengbergs moved east along the Arctic coast to Darnley Bay, northwest of the present day community of Paulatuk, where they lived a traditional Inuit lifestyle. In 1915, the Canadian Arctic Expedition set up a base at Darnley Bay and hired Patsy as a guide and interpreter. "In return he was taught how to read and write, how to do math, a little geology and natural history, but most importantly, modern techniques for treating and preserving furs," the Prince of Wales Northern Heritage Centre notes. "Combining this knowledge with his Inuit traditional knowledge helped the Klengenberg family prosper as trappers and Patsy and his father began to transport furs to Seattle where goods were purchased and brought back to the Arctic for trade to Inuvialuit and Inuit trappers. This became a very profitable business that Patsy inherited when his father retired to Vancouver." Expanding his network of trading posts in the 1930s, he purchased a schooner called *Aklavik*. Early on 31 August 1946 tragedy struck when a fire broke out while Patsy was in the engine room. The ship exploded and Patsy's body washed ashore thirteen days later. See PWNHC, "1915 Patsy Klengenberg," http://www.nwtimeline.ca/1900/1915_PatsyKlengenberg.htm. On the Klengenberg family see Christian Klengenberg and Tom MacInnes, *Klengenberg of the Arctic: An Autobiography* (Toronto: J. Cape, 1932).

Simpson Strait. Open for about five miles east and west of Gladman Point. Deserted Hudson's Bay Company House at Gladman Point and two native tents about five miles south of the Point across the Strait.

Douglas Bay. Open to the south, full of loose ice. No protection on this bay.

Rae Strait. Solid ice for over fifty miles.

Bay North of Booth Point. At 68°30'N 96°25'W. This bay is about five miles long, nearly free of ice, deep water, good beaches and shelter. Very small entrance to Rae Strait. Several streams into the bay at the north and west end. A three mile long lake close to the west side and clear of ice. Several long level landing strip sites here.

Schwatka Bay. Full of ice, very open, several of the smaller bays here have good beaches and shelter. Unsafe for aircraft use.

East Coast of King William Island. From Matheson Point to south end of Tennant Island has no useful harbour, very open, sandy shore line with many shoals and rocks. Very shallow all along this shore and ships could not land here safely anywhere.

Peel Inlet. South end free of ice and could be used. Appears sheltered and deep with fair beaches. Large stream at south end.

Tennant Islands. Level tundra, several gravel areas and lakes, shallow shore with boulders, surrounded by ice; no useful bays or harbours.

Matty Island. Similar to Tennant Islands, but several bays which may be useful if the ice ever leaves them. RCMP Captain Henry Larsen states this area always bad for ice conditions and aircraft would never be safe here.

James Ross Strait. Solid ice, a few patches of fog.

Boothia Peninsula. Area at Cape Christian fairly level and sandy. Snow covered 500 feet, rocky hills about five miles to the east.

Josephine Bay. Frozen over, a small area open at end of the Bay. Appears to be a small stream here. Bay is open to the south and not enough protection from the ice to be of much value.

Spence Bay. Main bay frozen over but some of the smaller bays are partially open, appear deep with good shelter and fair beaches. Should be suitable when free of ice, appears to be the best prospect in the area. Many small islands and rocks just clear of the ice in the main bay. All the lakes in this area are frozen over solid. The map is very inaccurate.

Lord Mayor Bay. Frozen solid, has very rocky rugged shore.

Thom Bay. Shows signs of breaking up is full of loose ice. Has steep, short sandy beaches and bluff to 500ft. Very deep water, fair protected harbour, has several streams flowing into the bay. Larsen states this bay is full of fish and seals and native families up to forty (40) in number have wintered here.

Gulf of Boothia. Gulf of Boothia is solid ice as far as can be seen (50 plus miles).

Elizabeth Harbour and Eclipse Harbour. Show promise of good shelter, deep water, fair beaches, presently full of loose ice. The narrow strip separating the two harbours is the best natural location for a strip seen in the area, over a mile long, level and gravelly, good approaches.

Area to the Agnew River, north along the coast from 70°45'N to 71°45'W is very level here. Mountains are about twenty five miles from the coast. The area is half level gravel areas, old beaches and half lakes and streams. Many of the gravel areas appear large and smooth enough for landings. Very few large boulders and obstructions. Coast line is very shallow, scattered ice out for some distance. Some fog along the coast. Nudlukto Lake frozen over.

Fort Ross. Terrain more rugged here and all bays full of ice. Hazard Inlet full of ice. Considerable patchy fog. Hazard Inlet appears to be best harbour for aircraft, good shelter and beaches, plenty of gravel here. Hudson Bay Post and native tents at Fort Ross.

Bellot Strait. Rugged, full of loose ice, strong tidal currents here, does not freeze over. Considerable snow on the hills and all lakes frozen over.

Franklin Strait. Solid ice. West coast Boothia rocky and rugged. Flying north by compass to go south, 180° variation compass very sluggish. Several good sheltered bays not correctly shown on the map.

Wrottesby Bay. Solid ice.

Tasmania Islands. Very rocky and rugged; some open water here.

Hartstina Point. Sloping limestone shore for several miles.

Weld Harbour. Fairly small for a harbour, good shelter, sandy, level, area suitable for landing strip one-mile long. Smooth gently sloping limestone from Weld Harbour to Pasley Bay.

[*Paisley*] Bay. Terrain barren tundra. Bay has three arms, north arm fairly long, good shelter except from the south, still frozen over. South arm still frozen over, sheltered except from the north; the least suitable of the arms. East arm is over three miles long and one mile wide; was almost clear of ice appears to be deep good beaches and shelter. At the entrance to the east arm, Patsy Klengenberg has a fair sized house and warehouse. Larsen reports the water as being 18 feet deep in front of the house and boats can tie up at the shore there. The *St. Roch* spent the winter of 1941 in the north arm having been forced in by ice on the 3rd of September and leaving on the 4th August 1942. Larsen states the east arm is very good, the two fair sized streams flowing into the east end clears the ice out early in the spring. The narrow entrance keeps out the pack ice. Fish and seal were very plentiful here all winter indicating the water is over eight feet deep. Ducks were also plentiful in summer. Some caribou reported to

the east. Several level areas here suitable for landing strips. Area south of [Paisley] Bay rolling barren tundra with small lakes and limestone ridges.

Kent Bay. Frozen over has a few sheltered coves, fair beaches, some shoals too open to be of much value.

King William Island

Prince George Bay. Very open, one small sheltered cove full of loose ice.

Port Parry. Main part of bay frozen over but south end open for over three miles; very clear, appears fairly deep, over ten feet. Bay is fed by fair sized stream emptying a chain of lakes. Native camp and fish traps at the river indicating the presence of fish. Several large lakes about ten miles to the south. These lakes are still frozen over; one being over five miles long. They are not shown on the map. No outstanding area suitable for a landing strip here but terrain is level gravelly tundra on which one could be located. Good site for flying boats and camp site.

Collinson Inlet. Clear of ice only at the south end and along shores. Poor beaches, shallow near shore, south end has fair shelter. Large lake to the south west frozen over.

Seal Bay. Fair sized stream runs into this bay from a large lake; this keeps it open for about a mile. Bay appears deep but is fairly open; water shallow near sandy beaches.

Erebus Bay. Frozen over, fairly open but has many small bays and coves with fair shelter. Most of these are too small to be of much use except as emergency shelters.

Victory Strait. Solid ice at north end loose ice towards the south. Ice in Queen Maud Gulf shows signs of loosening since the morning due to strong east wind. Some rain and fog here and visibility poor.

Cambridge Bay - East and North Coast Victoria Island - Holman Island - 9th Aug 1946.

Freshwater Lake. Very little ice in this large clear water lake, water is deep, good shelter and beaches. Many sand islands. Large lake at 69° 25'N 105° 30'W still frozen over solid. Country is rolling tundra with many lakes of all sizes.

Albert Edward Bay. Considerable floating ice, deep water, good beaches. Bay is too large for good shelters but some of the smaller coves and bays would be suitable. Some new ice in the smaller bays. This bay is reported as unsafe due to ice moving in from Victoria Strait. Many old gravel beaches several miles long. Easily made into landing strips with very little labour.

Victoria Strait. Packed with ice. Many shoals and low gravelly islands between Admiralty Island and Cape Alfred.

Lake at 69° 50'N 100° 50'W. Over three miles long, clear of ice, deep in the centre but has shallow areas and shoals near the shore.

John Halkett Island. Shoals between island and shore, low flat gravelly island, full of small ponds. Several lakes in this area large and deep enough for emergency landings.

Denmark Bay. Full of ice and appears very shallow. Shoals and islands at the entrance to the bay. Very level and gravelly areas south of Cape Michelson on the peninsula.

Norges Bay. Full of loose ice, shallow and open.

Fredrikshald Bay. Full of ice, deep water, fair sandy beach, poor shelter.

McClintock Channel. Solid ice as far as can be seen.

Greeley Haven. Long narrow bay over three miles. Deep water, good shelter and beaches. Large stream flows into north end of bay. Terrain on the east coast has been flat, gravelly tundra. Many lakes and streams. Coast has been flat and shallow.

Bay at 72° 25'N. Good shelter, and beaches, deep water, bay is three miles long and has a lake extension three miles long separated from the bay by a narrow strip. Lake is deep with good shelter and beaches. Both bay and lake were free of ice. This appears to be the best harbour on the east coast. Water is deeper along the coast with loose ice. McClintock Channel ice is very solid with many large sections of pack ice or glacier ice.

Strait at 72° 45'N. The maps show the north east corner of Victoria as a peninsula, from observations on this flight there is a channel or strait over one mile to five miles wide. This strait runs from 72° 45'N on the east coast of the island west, north west to Hadley Bay at about 72° 53'N. The strait is from one to five wide and is choked with many islands. From a surface craft in McClintock Channel or Hadley Bay this strait would be hard to detect as it runs diagonally and is full of islands. Every effort was made to draw in the strait and the surrounding terrain and photographs were taken at each end. There was considerable fog moving in and it was necessary to carry on.

Terrain north of the new strait is hilly, generally tundra with many lakes and streams. Large lake frozen over at 73° 05'N 106° 35'W stream from the lake flows east over falls some 150 feet high. Along the north side it is quite rugged with many deep stream beds, the west side was obscured by fog, from limited observations it appeared to be similar terrain. Water appeared very deep here and the ice extended as far as could be seen in Viscount Melville Sound and McClintock Channel.

Hadley Bay. Not correctly shown on the map. Bay was frozen over. Terrain is hilly, limestone gravelly tundra along the east side.

Bay at 72°35'N 112°35'W. This bay has fair shelter, deep water and good beaches, two streams empty into the bay and the ice was clearing. South end of Hadley Bay is fed by two large streams, very deep, clear of ice for about one mile, good beaches, level terrain, several good sites for a landing strip. West side of Hadley Bay is more rugged, has a few smaller bays with poor shelter, several large streams here.

Wynniatt Bay. Completely frozen over, surrounded by high bluffs which were covered with fresh snow.

Gleneig Bay. Obscured by fog appeared to be still solid ice.

Richard Collinson Inlet. Frozen over at the mouth on north end. South end was fairly clear but had a few grounded ice cakes. Flat shore line, deep near east side and centre, shoals on the west side. Two large streams at south end. Sod house with roof caved in and large ship type boat with oars and kit in it on a point on the west side of the bay at approximately 72°45'N 113°40'W possibly an early explorers camp. At the south end of the bay there is flat area about ten miles long. Appears to be clay or sand and to have been flooded at one time, very level and clear of obstructions, looks suitable for wheel landings in its present state. Terrain south of the lake towards Minto Inlet hilly tundra with many lakes and streams. Considerable fresh snow here.

Minto Inlet. Terrain very rocky and rugged, some drift ice in the inlet.

Holman Island - De Salis Bay - Berkeley Point 71.39N 119.05W - Native Camp at 71°12'N 118°07'W - Holman Island - Port Brabant - Linakuk Island - South Coast Prince Albert Sound - Holman Island 8th Aug 46.

Very little floe ice in Amundsen Gulf. A rocky bluff extends along the coast to an average height of fifty feet. Crossed Prince of Wales Strait to Berkeley Point via Ramsay Island, considerable loose ice to the north, open water along the shore on each side of the Strait. Water is very shallow between Ramsay and Berkeley Point. Berkeley Point tapers off to a long point[.] A peculiar formation of rocks, believed pushed up by the ice action, noticed here. Native camp consisting of five tents located on the Point, about a dozen natives were seen.

Walker and all other bays in this area were full of loose ice. Rock cairn about ten feet high on the west shore of Winter Cove and two gasoline drums were noted on a sandpit to the north of Winter Cove. Lake north east of Fish Bay quite large.

South across Minto inlet which had considerable loose floe ice near the entrance and looked quite solid to the east. Landed at Native Camp at the mouth of a large river flowing from the east parallel to the south shore of Minto Inlet. This river not shown on the map and is located at approximately 71°12'N 117°07'W. Camp consisted of ten tents with about thirty natives living there. Information obtained from the natives; the river opens late in June

the current keeps the ice away from near the mouth. The river is three hundred yards wide, twenty feet deep in the centre for a distance of over a mile from the mouth. The river was teeming with salmon. This camp is permanent; the natives were very cooperative and appeared healthy and intelligent.

Terrain to Holman Island was rocky and rough, several large clear lakes suitable for use by float planes. Refuelled at Holman Island. Proceeding east along the north coast of Prince Albert Sound [—a] very rugged coast with straight high rocky bluffs up to 700ft. Many bays all of which have poor protection from drifting ice. At approximately forty miles east of Holman Island observed a native camp of five tents, some natives were seen. Bluff extended for ninety miles east, then the terrain becomes gently rolling tundra. Many small lakes and streams, very few of the lakes were suitable for float aircraft. The Sound was filled with loose floe ice.

Circled Port Brabant, fair sized shallow fast river enters the Sound here. Native camp, six tents a half mile west of the mouth of this river. A camp belonging to Andy Klengenberg, famous Arctic hunter, is located a half mile to the southwest of the native camp and five hundred yards from shore on a very small island. [Klengenberg's] schooner was beached on the north side of the island. Camp consists of one tent house. Crossed Prince Albert Sound to Linaluk Island on the south coast.

Large lake two and half miles long, two hundred yards south from the coast directly south of the west end of Linaluk Island. The lake was clear of ice, fairly deep, good beaches. Coast to the west is open with no protection and no lakes suitable for aircraft use. Terrain inland slopes from the shore to a height of three hundred feet, mostly tundra. A few small streams in deep ravines. Set course from Cape Back direct to Holman Island.

Holman Island - De Salis Bay - Sachs Harbour - Cape Kellett - East to North East Corner Banks - Holman Island - 13th Aug 1946.

Some floe ice south of De Salis Bay. This ice appeared to be moving from Prince of Wales Strait. Heavy swell in outer harbour at De Salis Bay due to thirty mile an hour wind. The sheltered lagoon here was quite calm and safe for float aircraft.

Proceeded westerly through Masik Pass, which is a large valley running from De Salis to Thesiger Bay on the west coast of Banks Island. This valley has considerable vegetation consisting of grass, moss and willows. A fair sized stream flows west down the valley. The hills to the south called Durham Heights are steep to a 2,000 foot maximum height.

Many lakes north of Thesiger Bay, several of which were suitable for use by flying boats, being over two miles long. Some floe ice three miles off shore.

Fifteen miles south of Sachs, observed two lakes near the shore, a fair sized stream flows from the lakes, north west parallel to the coast, emptying into Sachs Harbour. Landed at Sachs Harbour, native village was deserted. Proceeding north of Sachs along the coast to Cape Kellett, hills to three hundred feet, a half mile from shore with plateau extending north east for over ten miles.

Cape Kellett. A hook-shaped sand pit creating a small harbour. Poor shelter for aircraft as there was a heavy swell in the bay. Native schooner anchored here, the crew hoisting the Canadian Flag when the aircraft approached. No landing attempted the water being too rough. Considered unsuitable for aircraft. Large ice pack fifteen miles off shore, some loose ice near the shore. Course set direct for large lakes known to exist on the north east corner of Banks Island. Large river flows west into the sea twenty-five miles north of Cape Kellett. This river is over a hundred miles long.

Terrain is rolling prairie like country with considerable grass growing, many small marshy lakes. About ninety miles north east of Cape Kellett, higher country with bluffs was observed to the north. At intervals of fifteen miles, fair sized rivers all flowing north were seen. Country appeared more barren here although the number and size of the lakes increased. Several level flat sandy or clay areas were seen. They looked like small deserts.

Landed in a large "L" shaped lake located about fifteen miles west of Prince of Wales Strait, approximately 73°18'N 118°10'W. The north south arm of this lake was ten miles long with the east west arm five miles long. Some ice at the north end of the lake. Surrounding terrain explored on foot and was also mostly rolling tundra with considerable grass, many caribou tracks seen. Also tracks believed to be Muskox. Some low willows growing here; they were found useful for firewood. Lemming were very numerous. One white fox was seen.

The fish net was set in the lake and lifted one hour afterwards. Seventeen lake trout were caught, total weight approximately 200 pounds. The largest fish weighing over thirty pounds. They were excellent eating. One sixteen pound trout was caught trolling from the dinghy using a salmon spoon. Many ptarmigan were seen.

Aircraft took off at 2240 hours for Holman Island crossing Prince of Wales Strait at the Princess Royal Islands. Loose floe ice south of Armstrong Point. Prince of Wales Strait north of Princess Royal Islands were packed full of ice.

SQUADRON LEADER (S/L) A.H. WARNER'S ACCOUNT OF THE OPERATION

"Operation Investigator left Edmonton at the end of June 1946, by way of Yellowknife, Fort Norman and proceeded to Aklavik, arriving there on 30 June.

A number of reconnaissance patrols were carried out from Aklavik including keeping a close watch on the break-up of the ice between Herschel Island and the Alaskan boundary at Demarkation Point. On 9 July, the party was able to land at Herschel Island where they found an old whaling post, Hudson Bay Company buildings and RCMP buildings still intact but the whole island was uninhabited by either white men or natives.

"The party landed at Clarence Lagoon, which is approximately eight miles east of Demarkation Point, on 10 July. The aircraft used were two Norseman, Mark IV on floats and one Canso Amphibian. The party consisted of eleven personnel. They were surprised how few people there were on this coast between Aklavik and Demarkation Point, there being only two families of natives observed.

"On 11 July, the party proceeded in the two Norseman aircraft from Aklavik to Stanton Mission on Liverpool Bay. At this Mission they had quite a talk with the natives with whom they found and were able to converse though their language was slightly different from the Eastern Eskimo. Here they met one native old-timer by the name of Silas, who had travelled with Stefansson on some of his Arctic work. They were able to get considerable information from this native in regard to northern coast and the mainland.

"From Stanton the party proceeded to Paulatuk Mission at the south end of Dranley Bay. The purpose of this operation was to determine likely aircraft bases. One thing of interest noted on the trip from Stanton to Aklavik was heavy smoke coming out of a mountain at Franklin Bay. The party flew quite close and found that the smoke contained a very strong odor of sulphur. Another interesting feature noted south of Tuk Tuk⁸ were cones of earth which were very [symmetrical] and rising to a height of approximately 300 feet as if they had been pushed up by some pressure under the surface. There were quite a number of these, I would say approximately 50 to 60. To the east of Paulatuk there was found a large quantity of coal of quite good grade and easily mined.

"Operation Investigator followed the north coast of the mainland from Paulatuk to Coppermine. This coast was the most barren part of the Arctic which was visited. There were few inlets or bays which could be used for shelter and lakes were very scarce, which is not a very desirable condition when flying with single engine aircraft.

"From Coppermine patrols were carried out via the Hudson's Bay Company post at the south end of Bathurst Inlet. This appeared to be an Arctic paradise compared with many parts of the country to the south. Caribou were in abundance as were many varieties of fish and the Eskimos all appeared to be

⁸ Tuktoyaktuk.

quite well provided for. The vegetation in this area is quite heavy for this northern latitude.

"Patrols were also carried out in Canso aircraft from Coppermine to Paisley Bay on Boothia Peninsula and a circuit of Victoria Island by way of Cambridge Bay, up the east coast around north, through Prince of Wales Strait by Hudson Gulf and back to Coppermine was completed. One geographical feature noted on this patrol was that the peninsula shown on the map as Cape Elvira is not a peninsula but an island. This large area of land is divided from Victoria Island by a strait from five to ten miles wide close to the south end of Hadley Bay.

"On returning from Bathurst the party took off at approximately 0230 and flew direct over the mainland to Coppermine. In the vicinity of the Hood River they came upon a herd of caribou in tremendous numbers. The ground was covered as if by ants by these caribou for a distance of over 40 miles (or 20 minutes flying time) and this herd extended on either side as far as the eye could see. It is estimated in this one herd alone there were several million caribou.

"The party also patrolled to Cambridge Bay on the 18 July and were able to land in the Bay even though the sea ice outside had not broken up. At Cambridge they visited the RCMP vessel *St. Rocque* [sic: *St. Roch*] which had spent the winter of 1945-46 in Cambridge Bay.

"In Richard Collinson Inlet the party observed a surf boat which, from the air, appeared to have been there many years. The oars were still in place where it was pulled up on the beach and it appeared to have rotted away in that position. There was a dilapidated house a short way up the beach from this boat. Ice conditions were such that the party was unable to land to secure any further information as to who had visited this point.

"On February 23 the party proceeded with the two Norseman aircraft to the Hudson's Bay Company winter post and Anglican Mission at Holman Island at the southwest of Victoria Island. Their operations from this point were considerably impaired by flow ice which came in about 30 minutes after they landed and completely closed in the bay. The party was grounded here because of this ice for approximately ten days.

"Patrols were carried out to the southern part of Banks Land, landing in the lagoon at Desalis Bay and carrying out considerable reconnaissance work from the ground. The party also landed at Saches [sic: Sachs] Harbour and spent approximately half a day in this area on the ground. There was no habitation whatsoever on this part of Banks Land at the time as the trappers had left approximately the week previous to the arrival of the party to trade their furs at Tuk Tuk and Aklavik. There had been observed one schooner in the Bay, formed by Cape Callett. This schooner appeared to be manned by Eskimos who hastily raised the Canadian flag when we circled their ship.

“Patrols were also carried out from Holman’s Island around Banks Land and the party landed in several lagoons in the northern part of this Island. The lakes found in the north were teeming with Arctic trout and salmon. Determining the types of fish they used a 30 foot emergency net and inside of 40 minutes had hauled in 200 pounds of fish. Many caribou were observed in the northern part of Banks Land. The white fox were very plentiful in this area also. Quite a number of old muskox heads and bones were found in this area. They pitched camp at one lake just to the south of Mercy Bay and in fifteen minutes had gathered sufficient of crawling slough vines growing in this area to build a roaring fire. From the air considerable quantities of coal was observed, in the low islands, about the centre of Banks Land. The lakes and shores on the northwestern part of the Island were almost white with the Wavy Goose which exists in this area. There are many large and beautiful rivers observed on Banks Land, the water being very clear with gravel bottoms.

“While at Holman Island the party was able to listen to many interesting stories from the natives who make their homes there. One chap who was very interesting had spent several seasons with Stefansson during his Arctic work in that area. He is known as Natkusiak or “Billy Banks Land.” He had many interesting tales of the north and his trips in that part of the country. He still seemed in quite good health considering his age and spent much of his time in the summer repairing boats at which he excelled over all other natives in this area, by far.

“While camped at the north end of Banks Land the pilot with whom the party was flying, namely, “Bounce” Weir, took ill and felt that the party should return to base at Holman Island immediately. The party was very reluctant to do this as they knew strong gales were blowing to the south and were afraid of what conditions might be like for landing at Holman’s Island. However, as it appeared he had appendicitis it was decided to break camp and take off. On arriving at Holman’s Island a gale of 60 miles an hour was blowing across the bay which made it impossible to land in this narrow stretch of water. The pilot attempted to land in the lee of the cliff outside the bay. The landing was almost completed when one float caught the top of the surf which was caused by the swell running at right angles to the waves. This punctured the float and allowed the wing to drop in the water making the aircraft helpless for taxiing. The Mission’s supply boat, *Our Lady of Lourdes*, was at anchor off the Mission and hope was expressed that they would know the aircraft was in difficulty and tow it to shelter. However, after pumping up our dinghy in the face of the aircraft starting to sink and placing rations and spare clothing in the dinghy there was still no sign of assistance. After some two hours drifting far out to sea and as the waves were very high and commencing to break over the aircraft, it was decided

for safety reasons to abandon the aircraft and take to the dinghy. The party attempted to battle towards shore at right angles to the waves and kept this up for approximately an hour and a half and were gaining slightly though the seas by this time were very rough and made it difficult to control the dinghy. Then the masts of the Mission ship were seen heading towards the aircraft. The party managed to tie a white rag on a paddle and draw attention to their location and much to their delight one of the natives observed this and the ship headed in their direction. Apart from a good soaking they were none the worse for this experience.

“On one of the parties patrols they landed at Minto Inlet and found nine families of natives at the mouth of a large river on the south side of Minto Inlet. These natives appeared to be a much hardier type than the average natives met in the south Arctic and were all quite well dressed. These natives appeared to be the only ones left who have knowledge of the large copper deposits in this area. This river, at the time of landing, was teeming with salmon, which were so thick in the water that they gave one the impression that you could almost walk on them.

“Patrols were also carried out on Prince Albert Sound and there were several families of Eskimos noted along the north shore of this Sound. At Fort Brabant, near the eastern end of the Sound, was the largest settlement of natives. One white man named Andy Clintonburg, had wintered at this point, where his schooner was now beached. A large settlement of natives was found at Reid Island in Simpson Bay on the southwest corner of Victoria Island.

“Approximately 23 August, the party returned by way of Coppermine, Norman Wells and direct to Edmonton.”

OPERATION “POLCO” JULY 19 - SEP 6/1947.

Introduction

The aim of Operation “Polco” was to establish 14 ground magnetic stations surrounding the general area of the North Magnetic Pole. The main object then was to take magnetic soundings to ascertain the magnetic field of the earth at these locations. With the results obtained the exact location of the pole and the strength of its magnetic field could be determined.

The operation commenced on July 19 and was successfully completed on Sept. 6. The present position of the North Magnetic Pole is approximately 72°45'N 100°40'N on Prince of Wales Island.

A single aircraft, R.C.A.F. Canso 11060, was used to carry out the operation. The party consisted of four men of the Department of Mines and

Resources and eight R.C.A.F. crewmen. R.C.A.F. personnel were F/O JF Drake, pilot and OC; F/O GW Allen, co-pilot; F/O K McCoy, wireless operator; F/O JE Goldsmith, navigator; Sgt B Hillman, flight engineer; Sgt RL Alexander, instrument mechanic; Cpl TM Roche, electrician; and LAC JJ Normand, rigger. Department of Mines and Resources personnel were two geophysicists, PH Serson and JF Clarke, two geologists, Dr. YO Fortier and HR Steacy. The Group was joined during the latter stages by Dr. L. Robinson a geographer and Dr. N. Polunin a botanist.

In locating the present position of the North Magnetic Pole ten ground stations surrounding the general area were established. At each of these the horizontal and vertical angles of the compasses were determined. Along with this a new electronic instrument was used to measure the strength and fluctuating factors of the earth's magnetic field.

The total flying time previously allotted for this operation was 59 hours, however the total time to complete the operation was 190 hours. Weather conditions necessitated many extra flying hours. For future operations of this kind it is recommended that more than the 25% of time allotted for poor weather be increased.

The party left Rockcliffe on 19 July and proceeded to the Arctic via Churchill. Ground magnetic survey stations were established at Aberdeen Lake (64°37' 109°N35'W), Yellowknife, Cambridge Bay (69°07'N 104°45'W), Greely Haven on Victoria Island (71°56'N 105°00'W), Tasekyoak Lake on King William Island (68°52½N 96°38'W), Guillemard Inlet on Prince of Wales Island (71°51'N 98°18'W), Agnew River on Boothia Peninsula (70°38'N 92°03'W). Allen Lake on Prince of Wales Island (73°41'N 98°26'W), Point Lake on Mainland (65°21'N 113°42'W). Jolly Lake on Mainland, (64°12'N 112°27'W). Upon completion of these points the expedition proceeded to Edmonton

Terrain

In a number of cases due to lack of altimeter settings the height of land given is only approximate and may be in error up to 200 feet. As a safety factor, therefore, in such cases a maximum estimation of heights of land has been made.

Churchill to Baker Lake the country is flat and covered with muskeg. There are numerous small lakes which gives a swampy appearance to the land. Large rivers in this area such as the Seal River, Thlewiaza River and McConnel flow in a west to east direction, emptying into Hudsons Bay. Baker Lake has hills up to 1,000 feet to the north and east. One high hill a few miles south west rises to

1,200 feet. The land decreases in height to the west. There are no hills above 600 feet along the shores of Shultz and Aberdeen Lakes.

Aberdeen Lake to Lake Aylmer region (64°N 109°W) is rocky with the terrain rising to 1,500 feet. No high hills in this area. Many large lakes but few rivers. This also is the general condition south to Yellowknife.

Lake Aylmer, Contwoyto Lake to Bathurst Inlet the height of land is approximately 1,500 feet with fewer lakes. One large range of hills at 65°50'N 100°W running NNW with peaks up to 2,000 feet may be part of the Peacock Range. In the proximity of Bathurst Inlet the hills rise sharply to 2,500 feet. Few lakes in this area but a number of rivers the largest being the Burnside River flowing into Bathurst Inlet.

Along the north coast of the mainland hills have been observed as high as 2,000 feet. The general contour of the coast is steep and rugged. There are numerous Islands at the mouth of Bathurst Inlet and in Elu Inlet.

Victoria Island is generally flat with numerous small lakes and muskeg. North east of Cambridge Bay there are a few high hills the highest of these being Mount Pelly 8 miles NE of Cambridge Bay which is 675 feet. The coastline along the south of the island near Cambridge Bay is composed of limestone cliffs and has a steep appearance. The coast of Collinson Peninsula is flat and has numerous small bays and inlets facing north west. The east coast from Denmark Bay to Greely Haven is low but has more regular appearance than that of Collinson Peninsula. No high ground above 200 feet was observed along this coast.

King William Island has much the same terrain as the south east of Victoria Island. The island is flat with no hills above 300 feet. It has many small lakes and rivers. The coastline is low and sandy.

Prince of Wales Island, southern half, is flat with numerous small lakes. The highest elevation in this part of the island is approximately 500 feet. The coast is low and sandy. The Northern half of the island has very few lakes but numerous shallow rivers. North of a mid latitude the land rises and becomes very rugged with hills up to 2,000 feet along the north east coast. Along the west coast the highest hills are approximately 800 feet. The height of land on the east coast is 1,500 feet. The land has a sandy, gravel appearance except the north east portion which is a reddish granite.

Boothia Peninsula has a steep rugged coastline and interior. Highest elevation approximately 2,500 feet. The land has the appearance of solid rock broken by deep river beds. There are very few lakes but many large rivers. Very little vegetation was observed.

Somerset Island, only the southern part flown over and the terrain is similar to that of [Boothia] Peninsula. Highest elevation noted was 2,000 feet. There

are few lakes but a number of small rivers. Stanwell Fletcher Lake at position 72°45'N 94°40'W is a very large lake and is almost perfectly round in shape.

Mapping

The areas flown over up to 65° North latitude were well mapped. North of here, apart from some coastlines, the mapping is poor. The general coastlines of the Arctic Islands are recognizable but detail is lacking and it is impossible to get an accurate pinpoint. Mapping of the interior of these islands is almost negligible.

Along the north mainland coast, Bathurst Inlet mapping is good, south coast of Kent Peninsula and Elu Inlet poor. In this area large bays are incorrectly positioned and many small islands are not shown. South of the coast to latitude 65°N a number of large lakes were observed, not shown on any maps. In some cases lakes on the map were not observed in their mapped position.

The south and east coast of Victoria Island is recognizable but detail is lacking. Gateshead Island on the east coast of Victoria Island is mapped incorrectly in all respects. The shape and size is inaccurate, the general direction of the island is NW, not North as shown on the maps. It is also out in position being approximately 12 miles further to the NNW. A smaller island, unmapped, was discovered between Gateshead Island and the coast of Victoria island. Mapping and position of Royal Geographical Society Islands is very confusing. It appears that these islands should be approximately 12 miles further north than shown on present maps and the Canadian Geographical Society Islands and neighbouring islands supposedly to the east are [non-existent].

Mapping of [King] William Island coastline is very good having been done from aerial photographs. In the interior of the island mapping is almost negligible and the only large lake plotted Amitsag Lake was not sighted or rather recognizable as such in the area as shown on present maps.

The general outline of Prince of Wales Island to the south is very poor and it appears that the southern tip of the island is shown 8 to 10 miles too far south on present maps. Fisher Lake 72°10'N 98°10'W is incorrectly positioned on map. Forsyth Lake, mapped position 73°02'N 99°45'W was not sighted and it is quite definite that if there is such a lake it would have to be small and not resemble the mapped lake in shape. Mapping along the north coast is fair. Russel Island may possibly be two islands as an inlet was seen with an opening to the north. Many high hills along the northeast coast are not mapped. On the east coast Prescott Island and the islands to the north are mapped well but the coastline from the north of Browne Bay to Back Bay is poorly mapped although recognizable.

Boothia Peninsula and Somerset Island mapping is fair along the coast but negligible in the interior. The coastline at Brentford Bay on the north east of Boothia is very poor and could not be recognized from the map.

Weather

From Churchill to Baker Lake low stratus and sea fog was encountered on all flights in this area. Yellowknife to Contwoyto Lake 65°30'N 110°30'W favourable weather generally prevailed during operation "POLCO". Bathurst Inlet Region and along north mainland coast was usually obscured by low cloud and fog. Cambridge Bay was generally cloudy with good visibility and ceiling. North of Cambridge Bay to Prince of Wales Island frequently fog bound. King William island fair weather with some fog. Prince of Wales Island and Somerset Island were either completely or partially fog bound at all times. Boothia Peninsula was noted as being usually clear.

Fronts and weather generally had a west to east movement. The best flying weather in these northern regions is from the time the land is clear of snow until approximately 15 August when the main bodies of water have large open leads in the ice. From the 15 August on fog conditions become increasingly worse.

It is thought that in these areas the best weather for photographic operations would be from the latter part of June until the first week in August.

Ice Conditions

July 21, southern parts of Baker Lake, Aberdeen Lake and Shultz Lake ice bound with open water to the north. Practically no drift ice. July 23, Aylmer Lake, MacKay Lake, Lac Do Gras and other large lakes in this area had the majority of their surfaces ice covered. Open water was too shallow for Canso operation. Smaller lakes in this area were clear. Conditions were the same on July 30.

August 1, solid ice in McClintock Channel, Franklin Strait, Victoria Strait and Queen [Maud] Gulf. Some open water in Dease Strait. Most of the lakes on King William Island were free of ice. Lakes along east coast of Victoria Island north of Denmark Bay ice covered. August 3, Simpson Strait, open water with drifting ice but solid from longitude 98°W into Queen [Maud] Gulf. West coast of King William Island icebound. Queen [Maud] Gulf south of Victoria Island some open water.

August 8, Contwoyto Lake and all lakes in Lac De Gras, Aylmer Lake regions were clear. Bathurst Inlet and Elu Inlet were free of ice.

McClintock Channel and Franklin Strait still icebound. Lakes on southern part of Prince of Wales Island were clear by August 12. August 13, ice packed solid all around the coast of Prince of Wales Island except to the north over

Barrow Strait where areas of open water were observed. A few small openings in the ice at Browne Bay was noted. Denmark Bay on Victoria Island free of ice. August 14, Paisley Bay on west side of Boothia Peninsula free of ice in north and south inlets, mouth of the bay contained much pack ice. One lake in the center of Boothia Peninsula still icebound. Gulf of Boothia icebound.

August 18, ice conditions showed no change in McClintock Channel and Franklin Strait. Browne Bay had more open water. August 23, ice conditions the same. August 26, ice broken along west coast of Boothia Peninsula and ships could probably navigate along here successfully. Transition Bay near Fort Ross free of ice. Some drift ice was observed in Brentford Bay. Stanwell Fletcher Lake on Somerset Island was half covered with ice. Pasley Bay on Boothia Peninsula was filled with drift ice and the two inlets which were clear on August 14 were also full. Large areas of open water were observed. August 27, Queen [Maud] Gulf south of Victoria Island almost completely free of ice as was Dease Strait.

New ice was observed on one lake in the north of Boothia Peninsula on August 26. Very little snow was seen except towards the latter stages of the operation when new fallen snow was observed on high hills in the Arctic Islands.

Navigation

No aids to navigation were available during majority of flights as elementary methods of navigation were used i.e., Dead Reckoning and Astro. Magnetic compasses were of no use north of 67°N latitude so astro compass was used at all times. Course was checked every ten minutes and steered by pilot's directional gyro. It was expected that course would only have to be checked once over twenty-minute periods but erratic behaviour of directional gyros necessitated more frequent checks and 10 minute periods were found to be sufficient.

Since the sun was above the horizon at all times on the majority of flights no flying could be classified as "night flying". The MK 1XA sextant was used to good advantage and many sun position lines were plotted. The Canso aircraft offers a rather unsteady platform for taking astro observations and so accuracy suffered. The average accuracy of astro observations plotted were usually found to be within ten miles. Since no other navigational aids were available, in most cases this was the only possible means of checking track and ground speed. Under the circumstances accurate navigation was practically impossible all results obtained were approximate but no difficulty was experienced in navigation during the operation. A good mental Dead Reckoning plot was found very useful on many occasions.

Map reading was possible at times although no definite pin points could be made due to poor mapping, a general position could be established along most coast lines. It was found that after flying over these areas a few times it became relatively easy to identify the main features on further flights. Fog was encountered on the majority of flights and it has been found that it is better to fly above it and [to] use the sun for steering course than to attempt to keep track of position by map reading.

In an operation such as "POLCO" flying was in the form of recce. flights and tracks flown were usually short. Therefore no great change in longitude was experienced so Grid Navigation was not used. Although on any long flights steering a constant heading is desirable. It is thought that Grid Navigation would offer the simplest solution of obtaining this constant heading.

To summarize, with the limited means of navigation available an astro check on courses and an air plot should be kept at all times. It is recommended that aircraft flying in the Arctic be equipped with a 360° scan radar such as an APS-10 as much fog and low stratus is [prevalent] during the summer months obscuring the ground. Directional gyros proved very erratic so these should be replaced by an electrically driven gyro[;] if this is not possible present directional gyros should be damped for the average latitude to be flown.

Compasses

Magnetic Compasses were of no use north of latitude 67°N. Directional Gyros were erratic and precession difficult to rate. The Radio Compass worked very well, picking up the beacon at Cambridge Bay at a distance of 100 miles.

Up to latitude 64°N magnetic compasses were accurate. Between 64°N to 67°N compasses were erratic and should be used with caution - the average accuracy was found to be within 5-10 degrees. [Occasionally] the error was found to be higher than this but may be caused by local magnetic disturbances. North of latitude 67°N the magnetic compasses should not be used. In some areas the compasses spun through 360° and at other times became very sluggish and held steady on one course for long periods. The fluxgate compass reaction is very deceptive at times. It was noted that the fluxgate held steady on one heading although the aircraft swung off course as much as 20°.

The new position of the North Magnetic Pole will necessitate changing the lines of variation on all maps. For example: at Allen Lake (73°42'N 98°25'W) on Prince of Wales Island the variation as found by the Magnetic Survey was 120°W whereas the mapped check variation was 180°E. This should have very little effect in an area 800 miles or more from the Pole. Another factor against using a magnetic compass in the polar area, even if one could be designed that would be sensitive enough to follow the weak field of magnetic force, is that due

to rapid change of variation close to the Pole the magnetic course would have to be changed so frequently as to make such a method almost impossible to use. At magnetic survey stations near the Pole it was noted that the variation fluctuated to a large extent over a short period of time therefore only an average variation could be plotted.

OPERATION FLIP

Introduction

This operation was carried out on the occasion of the sinking of the *Nascopie*, a government supply boat operating in and out of Hudson Bay and the Arctic Ocean. By the employment of an RCAF Canso aircraft, personnel of the RCMP and Department of Transport were flown in to take the place of those that were survivors of the supply vessel. This operation was completed within a week and hereunder is a summarized version of the report.

The only real difficulty encountered was the bad weather and the lack of reporting stations along the route, especially from Pangnirtung to Clyde River. Maps were fairly accurate, and in good weather no difficulty would be encountered with them, but in poor visibility lack of finer detail sometimes made it difficult to pinpoint. The compass was erratic at times and could not be relied upon, being too low all along the East and North coasts of Baffin. Frobisher radio range as shown on the map has the "A" and "N" quadrants reversed. Communications were generally poor to Churchill and outside, but between points of intended landing were good. The Department Of Transport (DOT) channels to Churchill were very poor, Nottingham Island Station appeared to be the weak link. The Hudson's Bay Company (HBC) radios on 4356 and "ham" sets operating on 3695 were most useful in obtaining weather information at destinations. The United States Army Airforce (USAAF) beacon operating on 352 kcs at Clyde River was put on for use and picked up approximately 150 miles away.

The HBC personnel did a great service in supplying communication facilities, moorings, boats, meals and accommodation at all stop-overs. It is believed that the [buoys] in some cases were put out [especially] for Operation "Flip".

Maps

A set of National Topographic eight mile to the inch maps were included with the operation order 8/47, and were used throughout operation.

These maps were found to be adequate for the type of navigation used on this operation, i.e. coast-crawling, and direct flights over short distances where no other navigational aids were available.

The shore lines in general were very well marked except around the northeast coast of Baffin Island, from Clyde River to Pond Inlet and the south shore of Devon Island. However even on these sheets no difficulty was encountered finding our way. In conditions of poor visibility considerable difficulty might have been encountered. Between Pangnirtung and Clyde River it was found that pin-points were hard to pick up due to poor visibility and lack of finer detail on the maps. Spot heights were generally too low over all parts of Baffin Island covered by this operation.

Very little can be said about the interior of Baffin Island as our routes carried us for the most part along the coast and the weather during the trip was such that the aircraft could not be flown at a great enough height to observe beyond the coast line.

It was found that the "A" and "N" quadrants of the Frobisher Radio Range were the reverse of those shown on the National Topographic series maps for that area.

Navigational Aids

Canso 9815 was not equipped with any special Navigational aids. A P9A compass and a fluxgate compass are installed, but during the first part of the trip the fluxgate compass became unserviceable and remained so for the remainder of the trip.

An astro compass was carried and used, however only one position is available for its use in the modified freighter version of the Canso, which is on the cowling beneath the windshield on the [co-pilot's] side where a removable bracket is installed. This position was found to be very unsatisfactory as a very limited range of sighting was available, and the aircraft had to be turned as much as 136 degrees to obtain a course check.

A drift recorder was carried and used when passing over large areas of water. A Sextant was also carried but due to weather was not used. A Radio Compass is fitted and was used where aids existed.

Radio navigation aids consisted of Radio Ranges at Churchill, Coral Harbour and Frobisher Bay and a Radio Beacon at Clyde River. Coral Harbour range was picked up shortly after take-off from Churchill, a distance of approximately 400 miles, and the same applied to Churchill range on the return trip. Frobisher Range was picked up approximately 250 miles away. The beacon at Clyde River was requested when the aircraft was about 150 miles away, and

was picked up immediately it was turned on. However a bearing could not be taken till the aircraft was within 75 to 100 miles and then only by the aural null.

Airports and Landing Areas

Landings were made at the following points, Coral Harbour (land), Frobisher Bay (land), Pangnirtung (water), Clyde River (water), Pond Inlet (water), and Dundas Harbour (water).

Coral Harbour. One runway in good condition except for 500 feet at the north end which was marked off with red flags and could be used without much danger if necessary. Information on this strip is contained in Canada Air Pilot.

Frobisher Bay. One runway in use and in good condition except for being quite rough. Information on this strip is also in the Canada Air Pilot.

Pangnirtung. Situated in Pangnirtung Fiord on the east side of Cumberland Sound. Pangnirtung Fiord is usable to aircraft for approximately ten miles. A reef extends across the mouth of the Fiord for nearly two thirds of the width, from the south shore, but there is still ample room for take off and landing. The Fiord is two to three miles wide and very deep. The settlement is on the south shore about seven miles from the mouth. The shoreline is very rocky and a reef shows at low tide extending some distance either side of the settlement about 150 feet off shore. The tide range is approximately 40 feet. Hills rise around 1500 feet on either side of the entrance and along both shores for about ten miles then rise to six to eight thousand feet at the east end.

The settlement consists of the HBC post, the RCMP Detachment, and an Anglican Mission with a hospital staffed by a doctor and two nurses. The HBC have one motor-boat about 30 feet long and one small rowboat. The RCMP also have one rowboat. A [buoy] consisting of a forty-five gallon drum anchored by a 300 lb kedge anchor is located outside the reef in front of the post. It is thought that an aircraft would have difficulty getting enough anchor cable out to permit the use of an anchor due to the high tide and the depth of water. The boats are kept inside the reef and only the rowboats can be used when the tide is out unless the larger boat is moored outside before the tide goes out.

The HBC have a radio operating on 4356 kcs and the manager also has a "ham" set operating on 3695 kcs.

The anchorage is well sheltered but the people there say that winds up to sixty miles per hour sometimes come through a cut in the hills a mile east of the post, making the bay very rough. The harbour was free of ice during our stay and had been so the two weeks previous. Large areas of ice were noted in the southern part of Cumberland Sound.

No aircraft fuel is available at Pangnirtung. Weather forecasts can be relayed to Pangnirtung via DOT at Clyde River as a sked is kept every night. Spot

weather reports will be given by the HBC manager on request. Very limited accommodation is available at the mission and limited supplies of food and other essentials are available at the HBC store.

Clyde River. The settlement is located in a small inlet on the north shore of Clyde Inlet. This inlet is approximately eight by two miles, with hills rising to 1500 feet on either side of the entrance, and low ground at the north end. The settlement is about one mile from the north end on the east side of the Inlet. The water is shallow at the north end about one half mile beyond the post. There is a good sand beach in front of the settlement, but there are a few large rocks a short distance out in the water, making it dangerous to taxi an aircraft into the beach. The tide range is around nine feet.

A buoy was available consisting of a forty-five gallon drum anchored with an old boat engine. The HBC have one Peterhead boat about forty feet long and there three or four small rowboats around. 3300 gallons of 100 octane gasoline and both DMS 80 and DMS 100 oil are available in the RCAF cache. Limited supplies of food and other essentials are available at the HBC store and limited accommodation at the DOT detachment.

The settlement consists of the HBC post, the DOT Ionospheric station and an American weather station. The DOT have a W/T Transmitting station and keep skeds⁹ with Pangnirtung, Pond Inlet, Dundas Harbour, Arctic Bay and Nottingham Island. The Americans have skeds with Frobisher Bay. A USAAF beacon operating on 352 kcs will be placed in operation on request. One half hours notice is required.

Forecasts could be passed from Churchill to Clyde River via Nottingham Island and spot weather reports can be obtained from Clyde River.

Considerable ice was noted at the mouth of the harbour in Clyde Inlet, both pan and large bergs, some of which drifted into the harbour during the time we were there. The harbour is not very well sheltered from north winds but aircraft could be pulled out on the beach in the case of high winds.

Pond Inlet. The settlement is situated at the east end of Eclipse Sound at the entrance to Pond Inlet. The take-off and landing area is unlimited in all directions. It is open to west and southwest winds with a sweep of thirty miles and could become very rough. A [buoy] was available consisting of a forty-five gallon drum anchored by a 100 lb. ledge anchor. There is a good sand beach in front of the post but there are a few rocks just off shore. Aircraft could be pulled out on the beach if necessary.

⁹ Scheduled radio contacts.

The settlement consists of the HBC post, RCMP Detachment, an Anglican and a Catholic Mission. Limited accommodation is available at the missions and limited supplies at the HBC store.

There is 1890 gallons of 100 octane gasoline and Dimethyl sulfide (DMS) 100 and DMS 80 oil available in the RCAF cache.

The HBC post has radio equipment operating on 4356 kcs and the manager also has a "ham" set. Skeds are maintained with Clyde River and other posts. Spot weather reports will be given on request, and forecasts can be passed to there through Clyde River.

There are several very large canoes at Pond Inlet owned by the HBC and the RCMP. No power boat was in evidence.

Considerable pan ice and a few large bergs were seen in Eclipse Sound and Navy Board Inlet. Pond Inlet itself had been icebound until the day before our departure from Churchill. Only one large berg was seen near the post during our stay there.

Dundas Harbour. The settlement is located at the north end of Dundas Harbour. This harbour is too small for take-off and landings for Canso aircraft. Take-offs must be made from the harbour out into Lancaster Sound or out in the sound altogether. The harbour is fairly sheltered from all but south winds. A buoy was available but it is not known what was used to anchor it. There are shoals off the point at the entrance to the harbour on the east side.

Very little is known of the settlement as we did not go ashore. However there is an RCMP post and it is believed there is a mission there also.

The RCMP have a small radio and were contacted [en route]. A small power boat is also located there.

There are mountains rising three to four thousand feet to the north of the bay and hills two to three hundred feet on either side.

Mechanical Troubles

The only mechanical troubles encountered were one starting motor on the starboard engine and the fluxgate compass.

The starting motor burnt out and was changed at Clyde River as a spare was carried. The fluxgate compass went unserviceable soon after departing from Churchill and remained so for the remainder of the trip.

Observations of the Sea and Terrain

Coral Harbour to Frobisher Bay. Southampton Island along this route has very low ground and numerous small lakes which appear to be very shallow. None were noted suitable for aircraft operation. Foxe Channel in this area was covered with large areas of pan ice. The coast of Foxe Peninsula along the route

was very rocky with numerous islands and shores rising sharply to around 500 feet. Most of the land area appeared to be low lying with numerous small lakes and very little vegetation. The coast was crossed in the vicinity of Amadjuak and in this area was also very rocky. Low ranges of hills around 1000 feet run in a northwest southeast direction with low rocky country in between. Amadjuak Lake was seen but as we passed about twenty miles to the south of it very little can be said about it. Numerous other small lakes were seen in the area having rocky shores. As we proceeded inland the country became more mountainous and the hills rose to 1500 to 2000 feet as we approached Frobisher. The average height of the mountains in this area was around 4500 feet and occasionally rose to around 7000 feet with large ice caps. Bylot Island has mountains rising to 6 or 7 thousand feet on the north shore but the southwest corner slopes gradually down to about 100 feet. A little pan ice was seen in the west end of Eclipse Sound and a few bergs. The hills along Navy Board Inlet rise to 2000 feet on either side.

Devon Island. Very little of Devon Island was seen due to the weather. Mountains appeared to rise sharply from the south shore to heights of 3 to 4 thousand feet, and the shore for the most part seemed to be quite rocky. A few very large bergs were seen floating in Lancaster Sound.

Pond Inlet to Southampton Island. Our track took us from the south end of Milne Inlet down the east coast of Melville Peninsula to Coral Harbour. South of Milne Inlet, flight was above the overcast and very little was seen of the terrain, but through occasional breaks in the cloud it appeared to be quite low with quite a few small lakes, and a few of moderate size.

Many large areas of ice were seen in Foxe Basin. What little was seen of Melville Peninsula appeared to be not over 500 feet with a few small lakes, and rocky terrain.

The north coast of Southampton Island is quite rough with hills rising to 1200 feet, and very few lakes, until about halfway to Coral Harbour where the country flattens out and lakes become more numerous. These lakes appear quite shallow.

Frobisher Bay to Pangnirtung. The area around Frobisher is very mountainous with an average height of the hills around 1500 feet. Between Frobisher and Cumberland Sound, however, hills were reported up to 5000 feet. This was not verified as the aircraft was flown on instruments in this area. The south west shore of Cumberland Sound is sheer rock rising vertically out of the water to heights of 1000 feet, with numerous very deep rocky fiords. Very little vegetation was seen other than what looked to be moss.

Large areas of pan ice was seen in the southern half of Cumberland Sound with a few large bergs.

Pangnirtung to Clyde River. The east and west coasts of Cumberland Peninsula are the same as for the southwest coast of the sound with rock shores rising vertically from the water to heights of a thousand feet or more. A range of mountains extends all along the east coast of Baffin Island ranging from three to four thousand feet at the south end to around nine thousand just north of Pangnirtung, then tapering off to five to six thousand northward to Pond Inlet, with numerous ice caps. A few low flat peninsulas were routed to the south of Clyde River about 100 miles and from there on northward, with numerous small shallow water puddles and sand beaches. Some of these rose only 50 to 100 feet from the water, while others rose to 500 feet.

Pan ice and large icebergs were prevalent all along the coast from Pangnirtung to Clyde River. Most of the fiords were jammed with ice.

Clyde River to Pond Inlet. The shore line in this area although not as rocky or rugged as to the south rose quite sharply out of the water in most places, and the hills were more rounded. Many glaciers were seen in this area and although pan ice was not nearly as prevalent, large icebergs became much more numerous, many rising two or three hundred feet out of the water.

Observations General

The greatest difficulty found with weather forecasts on Operation "Flip" was the inability of the communications facilities to pass them to the aircraft in time to be of any use. The forecasts themselves were quite good, the greatest errors being due to fog forming off the large areas of floating ice. This condition would be difficult to forecast unless the position of the ice areas were known. Some research into this problem might reveal a general trend in the movement of these ice areas during the summer season, thus giving the forecaster some idea of the areas in which to expect this fog.

One thing was forcibly brought to the attention of the crew of the aircraft on Operation "Flip", and that was the danger to aircraft in this area from floating ice. In places where a beach is not available, bad weather or a major unserviceability might easily mean loss of the aircraft, due to not being able to airborne when ice was moving in. Therefore it is recommended that such places be avoided as much as possible and when a stay is necessary a twenty-four hour watch be kept. No difficulty in getting accommodation for the crew and passengers was experienced, although most of it was in private homes and missions. For the occasional trip it is thought that this arrangement might be alright but it should be kept in mind that stocks of food are replenished to these posts only once a year, and if many trips were made rations should be carried.

The limits of the operational season around Baffin Island appear to be governed by the movement of the icepacks after breakup. This ice seems to

move in and out of the harbours all through the summer and so no set period can be established when conditions would permit the operation of aircraft in this area. Ice conditions permitting, it is thought that aircraft could be operated to these points from about the 15th of July to the 1st of September, and possibly a little later.

OPERATION CANON

On 1 Oct [1947], 112 Transport Flight was informed by the Officer Commanding (OC) 20 Tactical Wing that an Anglican missionary was seriously wounded by an accidental rifle shot at his mission home, on Moffet Inlet. Medical aid was to be rendered immediately by an Army Medical Officer to be dropped there by aircraft and later when conditions permitted evacuated by air.

Intention

A briefing was held on the night of October 1st. Canon Maurice Flint was flown to Rivers from Ottawa to help with the briefing with his knowledge of the Moffet area, having lived there himself for several years. Canon [Maurice] Flint displayed hand drawn maps and photographs which were of a great asset to the briefing. The operation was to paradrop four Army Paratroopers including a medical officer into the mission along with supplies and radio equipment. The Army detachment was to depend on air supply until such time as a suitable lake and ice conditions permitted an aircraft to land and evacuate the personnel.

Preparation for the trip began immediately that night with all personnel drawing arctic clothing. Long range cabin tanks were fitted to the aircraft and it was then loaded with equipment and rations for the drop including a No.58, No.52 and Gibson Girl radio sets. A Herman Nelson Heater, large type dingby and 700 lbs. extra safety equipment were also carried.

On 2 Oct 1947 aircraft departed with the following crew:

Air Force		Army Paratroopers	
F/O R.C. Race	Captain	Capt. L.G. D'Artois	OC Detach.
F/O K.O. Moore	Co-Pilot	Capt. R.W. Willoughby	Medical Off.
F/O C.C. McMillan	Navigator	Sgt. W.W. Judd	Radio Tech.
F/L A.B. Morabito	Wireless Opr.	Sgt. H.C. Cook	Radio Opr.
CPL J.P. Rae	Crewman	Majr. G.A. Flint	Jump Master
		Sgt. E. Ross	Spare

Major [George] Flint was to act as jump master and be equipped to jump if necessary. Sgt [E.] Ross was to remain at Churchill and replace Major Flint on any resupply drops.

On 3 Oct 1947 the aircraft landed at Coral Harbour and made ready for the drop on the next day.

On 4 Oct 1947 aircraft departed for Moffet Inlet. In order to carry supplies and sufficient fuel the all up weight was 31,120 lbs. and the aircraft handled well.

The navigation problems were numerous. Due to the proximity of our track to the North Magnetic Pole, magnetic compasses were useless and were noted to continuously [...] swing over a range of 30 to 40 degrees. This meant that the sun must always be visible in order to fly Astro Compass courses. The maps were fairly accurate but the scale considerably out. Pin pointing could only be done on coastlines due to the fact that inland lakes were frozen and covered with snow therefor blending in with the surrounding country side. Later in the year when the sea is also frozen, coastlines are unreliable unless the coast is of a rocky nature and affords a definite [demarcation] between land and water.

On the flight up to Moffet accurate pin points were made on the South coast of Melville Peninsula and later on the North coast. The weather was such that both the sun and land marks were visible making accurate navigation possible. A further excellent pin point was observed in the form of a mountain 2 miles to the left of track and twenty miles from the Southern Coast of Baffin Land. This mountain was called Sugar Loaf Mountain by the crew due to its shape and moving pictures were taken of it as was done of all prominent pin points along the route.

The aircraft arrived directly over Moffet Inlet but due to inaccurate mapping and fog over the Inlet it was 45 minutes before the mission was finally [located] through a hole in the fog. The mission is located on a small strip of land some seventy yards wide jutting out into the Inlet from the base of a 600ft. cliff. This was obviously no place to drop men and supplies due to open water on both sides of the mission. A note and panel code was dropped on the mission informing the wife of Canon Turner of our purpose and requesting her to inform us by means of the panel code if we were in time to be of help. A suitable dropping zone then had to be found so the aircraft climbed above the fog which was lying some 200 ft. above the water. The country directly behind the mission was mountainous with no flat ground other than frozen lakes suitable for dropping. Furthermore most of these lakes had high cliffs surrounding them or the location was such that the aircraft had insufficient room to make a circuit between drops. Extreme caution had to be exercised to avoid being trapped, that is, flying into valleys too narrow to turn in or climb

out of and all turns had to be carefully [contemplated] before being executed to ensure the manoeuvre could be completed in the space afforded. A small lake eight miles inland, North East from the mission measuring 200 yards by 100 yards was located and afforded a clear approach for the aircraft. It was realized by the crew that rugged country would have to be traversed by the paratroopers to reach the mission but under the circumstances this had to be accepted.

Dropping commenced immediately, dropping a 250lb. drum of gasoline first in order to test the strength of lake ice. Thereafter the supplies and men were dropped. Some supplies were dropped first and were despatched at the same height as the live drops were to be made, in order to give the pilot an indication of how they were reaching the lake before risking the live drops on such a small drop zone (DZ). All supplies and personnel landed safely on the lake and Sgt [W.W.] Judd who jumped immediately after the small 58 radio set was in contact with the aircraft some 5 minutes after reaching the lake. The aircraft had now been over the area close to two hours so as soon as the ground party reported that everyone was safe a course was set for Coral Harbour.

A severe blizzard had set in at Coral Harbour by the time of arrival and after landing it was impossible to put on engine or wing covers due to the high wind so the aircraft was tied down securely by means of full gasoline drums.

Radio contact with Moffet was expected within 24 hours so the aircraft remained at Coral Harbour waiting for contact to be made. Refuelling was carried out on the second day with considerable difficulty due to a 50 MPH wind. By 6 Oct 1947 radio contact had still not been made with the party at Moffet so a reconnaissance flight over the mission was planned, however, weather at Coral Harbour delayed the flight until 8 Oct 47.

On this date the aircraft flew up to Moffet Inlet and while circling overhead made radio contact with the small 58 radio set. It was learned that the large 52 set was damaged on landing. A complete medical report was received from Capt. [R.W.] Willoughby along with a list of supplies that were needed. The party at Moffet were making preparation to proceed to Arctic Bay by boat, estimating the trip to take from 8 to 10 hours in good weather or 1 to 2 days in adverse weather. This move, if successful, would simplify the operation considerably due to the radio facilities at Arctic Bay. Further, there was a lake near the [Hudson's] Bay Post that was suitable for landing an aircraft and had been previously used during the war by the Americans to land a C47. The aircraft then passed on the information to NWAC and 11 Group Winnipeg through Cambridge Bay and Churchill and proceeded to Coral Harbour, continuing the following day to Churchill, to pick up the re-supply and wait for the ground party to reach Arctic Bay. In the hangar at Churchill the aircraft was thoroughly checked and starter motor replaced. Three days after reaching



Figure 6-18: Starting the aircraft engine with a rope at Coral Harbour. Source: DHH 181.003 D2261

Churchill it was learned through Arctic Bay that the party from Moffet had been forced back due to the sea ice conditions so extra supplies were loaded on the aircraft including a number 29 radio set. The operation now remained as originally planned, with the party remaining at Moffet, so it was imperative that they have suitable radio communications.

Adverse weather conditions at Coral Harbour prevented the aircraft from reaching there until 16 Oct 47 and proceeding the following morning to Moffet Inlet. Sgt Ross of the Army Paratroopers was added to the crew for this drop to help with the packing and despatching of supplies. Major Flint returned to Rivers. The weather conditions for this trip were ideal being Ceiling and Visibility Unrestricted (CAVU) over the entire route.

On reaching the mission it was found that a dropping zone was laid out right beside the mission house. This was considered as a very poor DZ due to the fact that the aircraft had to fly close to a 600ft. cliff and drop on an area only 70 yards wide then make a steep turn to the right to avoid a further mountain almost directly in front of the aircraft. However there was insufficient time for the party to reach a nearby lake in order to receive the supplies as they dropped, so the drop was carried out on the mission as requested. The drop had to be carried out in one direction only regardless of the wind and with an airspeed of 110 mph. in order to maintain maximum [manoeuvrability] of the aircraft. The aircraft was at a slight bank to the right when actual dropping

followed by a steep turn and increase in speed immediately after the load was cleared. A small circuit was then carried out over the Inlet and the drop repeated as before until all supplies were despatched. Signals to drop were given by means of the "bail out bell" in the aircraft and despatching by Sgt Ross was excellent. All supplies were seen to drop safely on the mission except the radio set which overshot the DZ due to being so heavy and therefor having a slight delay in the exit. The radio landed on [the] shore ice a few feet from the land but was soon retrieved and no damage was expected.

Immediately after the supply drop the aircraft proceeded on a reconnaissance for a lake suitable for a future landing and one was located approximately 11 miles [west] of the mission on the far side of the Inlet. This lake was 2 miles long and afforded a good approach from either end. A suitable route to the lake for the ground party was also located in the form of a series of rivers and small lakes leading to the lake chosen. This information along with the latitude and longitude and bearing from the mission was passed on to Capt. [Guy] D'Artois. The aircraft then proceeded to Coral Harbour and Churchill the following day to wait there until radio communications were established with Moffet. On the night of 18 Oct 1947 radio contact was made for the first time with Moffet Inlet and a further request for supplies was received. The main item needed was [penicillin], insufficient supplies having been sent from Winnipeg for the last drop.

The supplies for the next drop along with the necessary parachutes were requested from Winnipeg and were flown up two days later. The medical supplies were then carefully checked in the accompany of the Medical Officer at Churchill, packed and loaded on the aircraft. On 21 Oct 1947 the aircraft proceeded to Coral Harbour and there due to weather waited until 24 Oct 1947 before leaving for Moffet. The drop again had to be made on the mission due to low clouds and the mission itself being the only area with any ceiling. The aircraft was able to reach the mission by letting down through a hole in the overcast some distance up the Inlet then proceeding down the Inlet under a ceiling of approximately 200 ft.

A very careful study of the Inlet had been made on the previous trips and proved invaluable on this drop due to the restricted visibility. The drop was carried out immediately because of the lowering conditions and the [penicillin] was ordered to be dropped first in the event that the drop had to be discontinued for the weather. The ceiling was ragged and it was therefor impossible to remain out of cloud at all times in the dropping circuit with windscreen ice resulting, however, after four runs over the DZ all supplies were safely despatched and the aircraft climbed up through the overcast and proceeded back to Coral Harbour.



Figure 6-19: Operation Canon group photo. Back row (left to right): Flying Officer (FO) R.C. Race; FO C.C. McMillan; Flight Lieutenant A.B. Morabite; Corporal L. Hawkins; Sergeant (Sgt) K. Swinford. Front row (left to right): “Rebecca” with the Turners’ youngest child; Mrs. Turner and elder child; FO K.O. Moore; Sgt H.C. Cook; Sgt W.W. Judd; Captain G. D’Artois. Source: DHH file 181.003 D2261

The ground party now reported having sufficient supplies until the evacuation sometime in the middle of November so the aircraft proceeded back to Rivers.

At 112 Transport Flight Rivers, the aircraft underwent an eighty hour inspection and Dakota skis were ordered from Edmonton to be used in the event that snow conditions at Moffet were unsuitable for wheels. The skis were fitted to the aircraft in the hangar to overcome any snags that might be encountered when fitting them again up North. An extra crewman Cpl J.D. Hawkins and a Rigger Sgt K.C. Swinford were added to the crew to help in extra ground handling necessitated by the skis.

Information received from Capt. D’Artois stated that the lake chosen from the air was unsuitable for the ground party due to the fact that there were fast flowing rivers leading to the lake and therefor ice [too] thin to bear the weight of a dog team. A second lake was reported but rejected by the aircrew due to the nearby mountains described in the signal. A third lake was then reported and on plotting its position on a map could be seen it was on the edge of the barren

lands, 26 miles [south] of the mission and therefore would undoubtedly have good approaches. This lake was accepted until an aerial survey could be made of it.

The plan decided upon now was to proceed to Resolute Bay an airstrip 200 miles northwest of Moffet and from there proceed to the lake. This would enable the aircraft to carry less fuel, land lighter and make a shorter flight in the event that skis were used. The skis along with wing jacks were to be carried on board to Resolute Bay and there fitted to the aircraft if necessary. Also carried on board was a portable oxygen set, plasma and morphine along with an ambulance type stretcher and blankets.

On 5 Nov 1947 the aircraft proceeded to Churchill picking up mail at Winnipeg for Arctic Bay, Igloolik and Ponds Inlet to be transported later by dog team from Moffet. Adverse weather conditions held the aircraft at Churchill until 12 Nov 1947 and again at Coral Harbour until 17 Nov 1947. Extremely bad weather conditions were experienced at Coral Harbour with unusual high temperatures averaging between 18 and 30 degrees [Fahrenheit] [-8°C and -1°C]. A high pressure area over Baffin Land caused an Easterly circulation over Coral Harbour bringing in Polar Atlantic air with resulting low ceilings and freezing rain. Wing covers were very necessary at all times due to the freezing rain and if the weather cleared heavy hoar frost was encountered. Windscreen covers would also have been a big asset at this time. Ice also had to be removed from [propeller] blades before each flight. The runway at Coral Harbour at this time was very soft making a take-off difficult and as snow conditions on the lake as reported by Capt D'Artois looked suitable for a wheel landing the skis and jacks were loaded off at Coral Harbour to lessen the aircraft load. This also enabled the aircraft to carry three extra 45 gal. drums of fuel on board as had been done on all previous trips to give a greater selection of alternates. If needed the gasoline was transferred [by hand-pump] from the drums to cabin tanks while in flight.

On 17 Nov 1947 the aircraft took-off from Coral Harbour en-route for Resolute Bay and to make a reconnaissance of the lake at Moffet on the way. On reaching Moffet a low overcast had moved in and at the same time a radio report indicated that the weather was closing in rapidly at Resolute Bay so the aircraft returned to Coral Harbour.

On returning to Coral Harbour three alternate plans were decided upon:

- I. Proceed to Resolute as originally planned,
- II. To carry a Herman Nelson Heater, three extra drums of fuel and rations and land on the lake directly from Coral. An approximate eight hour wait was expected at the lake in this event and provided for, or

- III. To proceed to Cambridge Bay and then to Resolute, thereby following a more Westerly route where better weather conditions prevailed.

The weather conditions at these respective places would decide the plan to be adopted on the morning of take-off.

On the morning of 21 Nov 1947 weather was clear at Moffet and Resolute so it was decided to fly directly to the lake and use Resolute Bay as an alternate. Navigation at this point was even more limited due to the short daylight hours and by the fact that the sun never rose above the horizon at Moffet.

The aircraft reached the mission at mid-day and then proceeded directly to the lake as light conditions were failing rapidly and a landing would have to be made soon. Capt D'Artois was already on his way to the lake by dog team and was observed from the air. On reaching the lake visibility was reduced by ground fog but the silk panels indicating the landing path as laid out previously by D'Artois were visible when directly overhead. A gyro heading was noted from the panels and then by means of a "runway procedure" a landing was made. On landing the ground party were informed by radio to start out for the lake and Arctic Bay was instructed to transmit hourly weather reports on Churchill, Coral Harbour, Resolute Bay, and Cambridge Bay. These transmissions were to be made blind as no transmitting was to be made from the aircraft after landing in order to conserve the [batteries]. The aircraft was then refueled from the drums carried on board, engine covers put on and the Herman Nelson Heater made ready. A flare path that was carried on board was then laid out with the aid of the dog team.

After the arrival of Canon [J.H.] Turner and party it was necessary to wait several hours for weather conditions to lift at Coral Harbour. The flare path was then lit and with the aid of landing lights the take-off was made. The snow conditions on the lake were quite good, the average depth being from eight to twelve inches, soft and with few drifts. It was found that the wheels smashed through the snow with little resistance and the take-off, using one-quarter flap, was made in approximately 4,500ft. Due to the [bulkiness] and weight of the load taken on at the lake the Herman Nelson Heater was left behind. On leaving the lake the aircraft proceeded to Coral Harbour, remaining there overnight before flying directly to Winnipeg the following morning.

Conclusion

This entire operation was undertaken at the very worst time of year for Arctic flying and navigational aids were very few. Once the aircraft was beyond the



Figure 6-20: Putting the patient aboard the aircraft at Coral Harbour. Source: DHH 181.003 D2261

radio range at Coral Harbour there were no facilities for radio bearings. This left only two means by which navigation could be carried out, Astro Compass courses by day and Astro Navigation by night. By November the angle of the sun was very low with long periods of twilight giving neither sun nor stars. Maps were fairly accurate but pin points could only be made on coastlines. Weather conditions could change very rapidly and severe icing conditions were experienced in any cloud flying. However, with the excellent communication system in regards to weather reports, worked out by F/L [A.B.] Morabito, and the carrying of extra fuel supplies on board, each trip was carried out with a maximum safety margin. Except for the adverse weather conditions there were no serious obstacles encountered. The aircraft serviceability was excellent and Dakota once more proved itself as a very versatile and dependable aircraft for Arctic flying.

CHAPTER 7

FUTURE TRENDS

Introduction

During and since the Second World War, air activity in the Canadian Arctic has been increasing rapidly and it appears certain that this trend will continue. For years the possibility of trans-polar air routes has been debated. There now seems no question about the possibility, it is only a matter of time.

For air operations in the Arctic, climate does not seem to be the limiting factor. Though cold conditions prevail for long periods, extreme temperatures are normally found at lower latitudes.

There is a popular misconception that the coldest temperatures in the Arctic are experienced near the North Pole. Although it is true that the winter cold spells are more persistent over polar sea and the Arctic islands than over the mainland, the record low temperatures occur in the continental areas. These are the result of cold air stagnating over the land areas for days on end and gradually losing its heat to space. The Arctic seas on the other hand have a moderating effect even during the winter when they are covered with several feet of ice.

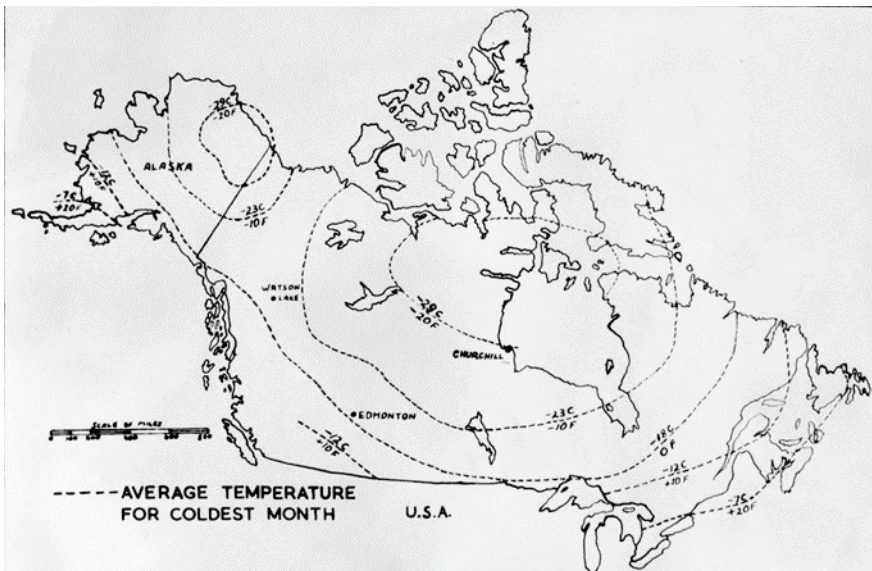
The record low temperature for the North American continent is -83°F [-64°C] at Snag, Yukon Territory, near the Alaskan boundary. February is the coldest month over the polar Seas whereas January is coldest in the neighbouring mainland. The average February temperature at Arctic Bay on northern Baffin Island is -27°F [-33°C] as compared with about -20 [-29°C] in the [Mackenzie] Valley and -15 to -20 [-26°C to -29°C] in the Yukon. The tempering effect of the unfrozen ocean is noticeable in the milder winters experienced in southern Baffin Island where above-freezing temperatures may occur in every month.

Even though the extreme temperatures are not so low over the polar area, as over the mainland the winter is long and severe and average temperatures below zero may be expected from November to April and periods of extreme cold continue for a considerable time. However, these periods of extreme cold are little worse than the temperatures that may be experienced at much lower latitudes in continental regions. All the winters are not continuously cold for throughout the Arctic the temperature may go as high as 20°F [-29°C] or more during January and February. A temperature of 30°F [-34°C] has been recorded at Bache Peninsula at latitude 78°N in February.

Average temperatures over the Arctic islands for July and August, the warmest summer months, range between 35 and 40°F [2° and 4°C], with occasional days when the temperature rises over 50 [10°C] even as far north as 70°N. Summer tempera-



Map 7-1: Average Date Start and End of Flying Season for Float and Boat Planes



Map 7-2: Average January Temperature in Canada

tures average 5 to 10 degrees higher in the continental arctic areas and southern Baffin Island, with occasional extremes of over 70°F [21°C] in the lower [Mackenzie] Valley.

Snowfall is in general very light throughout the Arctic ranging from 70 to 90 inches in southern Baffin Island to 25 to 50 inches over the rest of the Arctic islands and the polar seas. In this area snow may occur in any month of the year. The maximum snowfall occurs in the autumn with a secondary maximum in spring.

During the coldest parts of the winter, small amounts of very fine snow fall frequently. The depth of snow probably reaches a maximum in April and begins to disappear in May, although snow will remain on the ground in June even in the southern islands. Considerable drifting of the fine, loose snow takes place during the winter months and the accumulation is mainly in the lee of obstructions.

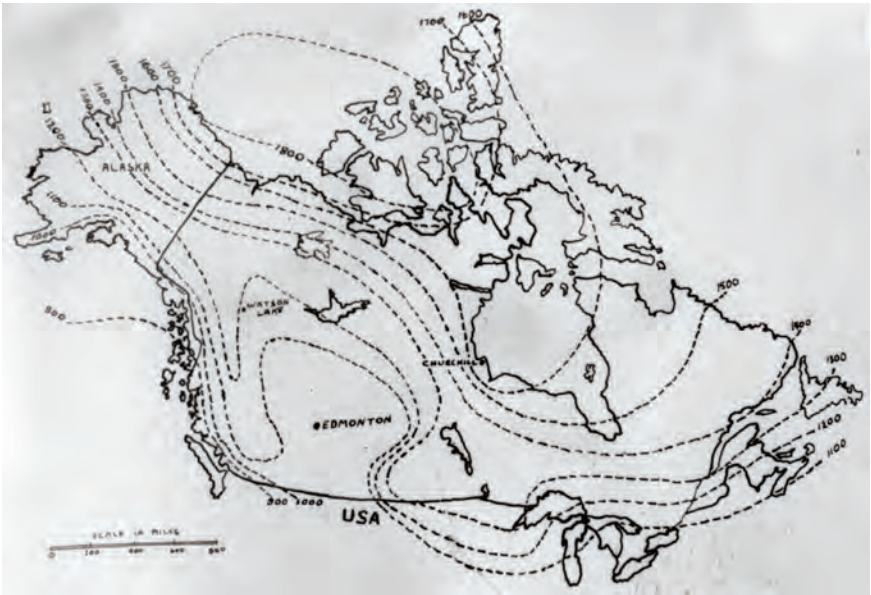
In the Arctic most of the rain falls in the period from May to October, 5 to 8 inches falling during this period over southern Baffin Island and the mainland areas as compared with 2 to 4 inches farther north.

In the Arctic, all seasons tend to be windy, and in some parts high winds are one of the most noticeable features of the climate. Severe blowing snow conditions are very common in winter. Although the winds are usually lighter during intense cold, gales may occur at low temperatures. The prevailing wind during the winter over the western Arctic islands is northwest but southerly winds are common over the Baffin Island area during this period. Winds are somewhat lighter over the continental areas and noticeably so south of the tree line. Summer winds over the entire area are generally lighter and more variable in direction than in winter.

Winter flying weather in the polar and neighbouring continental areas [is] generally excellent with ice haze and blowing snow providing the main problems. The few storms that invade the Arctic Ocean or bordering coastline areas are mild in character with limited cloud systems. Southern Baffin Island, however, frequently feels the effect of winter storms which have moved northeastward across Quebec.

During the summer there is a great deal of fog and low cloud over much of the Arctic Archipelago and the neighbouring coastline. These conditions are particularly common over and leeward of open water. Cloudiness reaches its maximum in July, but even then flying conditions above the shallow cloud layer are good. Over northwestern Canada summer is a season of good flying weather with generally broken cloud and good visibility. Mild storms passing through or just to the south of this area occasionally give overcast skies and rain. In certain years smoke drifts northward from the forested areas into the Mackenzie Valley and the Yukon. The frequency of these summer storms is greater in the area south and east of Hudson Bay than it is in the Northwest Territories and the Yukon, but even here the flying conditions are good except for the areas immediately bordering the Bay which are affected by considerable fog and low cloud.

Certain difficulties however still lie in the way. These have been well stated recently by Wing Commander G.M. Fawcett, M.B.E. [A] summary of his view's follow.



Map 7-3: Average January Wind Chill in Canada

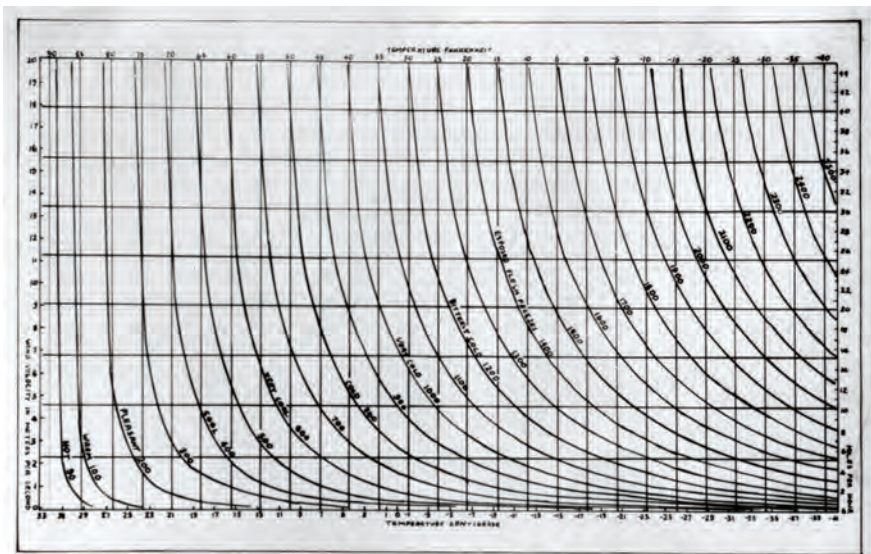


Figure 7-1: Wind Chill Factor

Some Existing Problems Confronting Aviation in the Canadian Arctic

“An attempt is made in this work to show some of the needs which are urgent today in the field of general research to assist aviation in the Canadian Arctic. The subjects which are discussed are:

- a) Precipitation static.
- b) The auroral zone.
- c) The magnetic pole.
- d) Polar navigation generally.

These will be found in separate sections of the text.

“An effort is made to keep the discussions on a non-technical basis, although in some places, the avoidance of technical language becomes impossible. The reader will find, however, that technical terms are defined in relatively simple language.

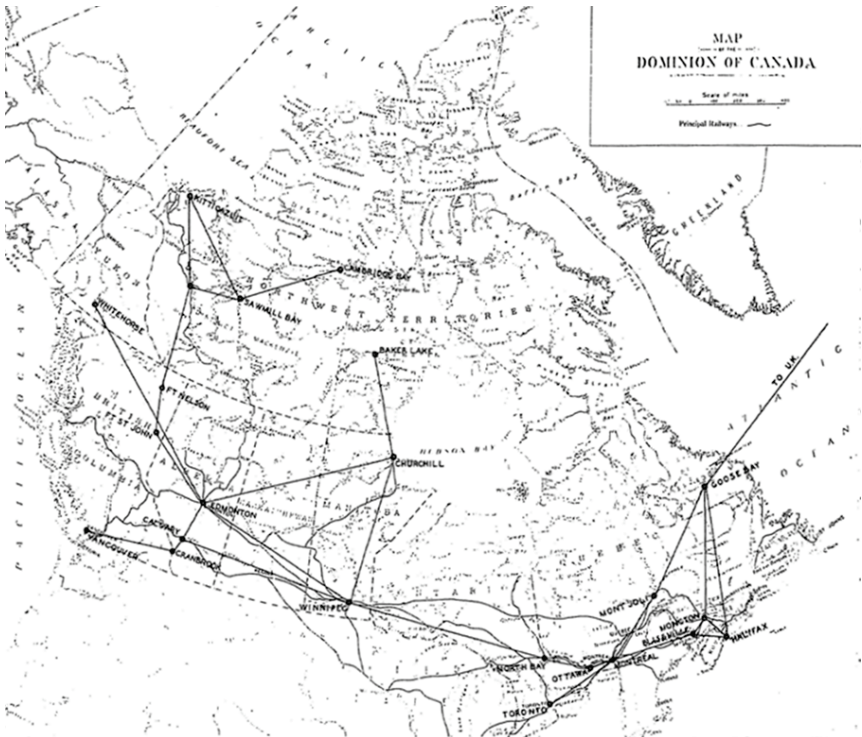
The Need for Aviation in the Arctic

Great Circle Routes - As an examination of the globe will show, many of the great circle routes from North America to other parts of the northern hemisphere lie partly in the area generally known as the Canadian Arctic. The route from the eastern seaboard of the United States to India and the Far East is an instance. Another is that from the Pacific Coast to Europe - especially Norway and Sweden. It seems reasonable to suppose that in the future these routes will become more and more important to aviation. Indeed, if flying in the Arctic were not so dangerous, they would probably be used a good deal more today.

Meteorology - Since meteorologists started using air mass analysis in forecasting, there has been a large gap in the Canadian Arctic Archipelago whence little or no meteorological information has been available. It is only now that, through the co-operation of the Canadian and United States governments, weather stations are being set up at Resolute Bay and Eureka Sound. These, and other similar stations which will undoubtedly follow them, can probably be most economically supplied by air, since they are located in areas where ice conditions are difficult, and consequently, ships cannot be relied upon for this duty. Thus, a requirement for aviation in the Arctic is created by the mere existence of meteorological and other stations of a military character which are even now being installed in the area.

The Requirements of Aviation in the Arctic

Safety - If aviation in the Arctic could be made safe, there seems to be no reason why it could not be just as satisfactory as it is in any more temperate part of the earth. However, to provide safety covers an enormous amount when one considers



Map 7-4: Service Air Routes in Existence in Canada Today (1948)

the area in question. There are few landing grounds and fewer navigational facilities, so that, at present, the only aircraft that can explore the Arctic are the larger ones that can make non-stop flights of two or three thousand miles. Even these can only search the area from the air. They cannot land and make a detailed reconnaissance or take measurements of such things as surface temperatures, wind velocities and ice thickness. Neither can they search for possible mineral or oil deposits.

Possible Approach to the Safety Problem - Development of the area, therefore, should take place. This means opening up the country and populating it to a much greater extent than it is today. Landing grounds of suitable size should be constructed, navigation facilities, including much more accurate maps, should be provided and, indeed, suitable aeroplanes should be developed and built. In addition, such natural phenomena as precipitation static, the auroral zone and the magnetic pole should be much better understood. When these things have been done, the Arctic should be almost as safe for aviation as any other part of the world.

The Precipitation Static Problem

What Precipitation Static Is - Precipitation static is known to the airman as the enormous "rushing" electrical noise that sometimes occurs and makes all his radios

and radars useless. As its name implies, it is a form of static caused by precipitation, or even by dust particles in the atmosphere. There are two main kinds - autogenous, or self-generating, and exogenous, or that which is generated from outside. In the autogenous kind, the aircraft must be flying in some form of precipitation or dust, while the exogenous kind may be present in the absence of precipitation but is usually caused by proximity to a large thunderhead in which there is an electrical charge. What happens is that, for reasons that need not be explained here, a very large electrical charge is built up on the aeroplane - sometimes to the extent of 200,000 volts or more. This discharges from all the sharp points of the machine, causing corona, or St. Elmo's fires as they are known to seamen. If these discharge points happen to be near a receiving aerial, noise is introduced by way of it into the receiver where it is amplified along with the desired signal. When precipitation static exists, the noise it generates in discharging may, and usually does, exceed the weak, desired signal by so much that the resulting signal-to-noise ratio is far beyond the capabilities of the receiver.

Precipitation Static in the Arctic - In the more temperate parts of the earth, especially close to large bodies of water, this phenomenon is not too serious, although this will probably be denied by those who have experienced it. However, in the Arctic, where the atmosphere is cold and consequently very much drier than elsewhere, the discharges cannot take place so rapidly because of the extremely dry atmosphere. The charge, therefore, builds up to a larger value and when discharged finally does begin it is very much more intense because of the greater pressure, or voltage. Such conditions are caused by the ice haze which is frequently found over vast areas of the Arctic and which may be very difficult to see. This ice haze consists of very small ice particles in the atmosphere which, on striking an aeroplane in flight, cause a charge to build up.

What is Being Done About it - "Obviously such a situation creates great hazards for aircraft flying far from landing grounds and in the absence of radio aids to navigation. This has been long recognized by the United States who have been working for some years on the solution at the Joint Army-Navy Precipitation Static Project, Minneapolis. Large amounts of money—reputedly in the neighbourhood of four million dollars—have been spent on the project and, to date, only a partial solution has been reached. An aeroplane can be protected from autogenous precipitation static for about 80% of the time. Less protection is given from the exogenous form and furthermore, the equipment used can break down without the fault being visible. When this occurs, complete refitting of the aircraft is required although the equipment is not expensive.

"The problem then is a serious one which is only partially solved at present, but which must be completely solved before aviation in the Arctic can be said to be safe as far as communications and radar are concerned.

Communication versus the Auroral Zone

What the Auroral Zone Is - Aircraft cannot fly safely without satisfactory communications. Furthermore, aircraft flying long distances generally need long distance communications. This can normally be achieved by the known laws of radio wave propagation. But in Canada, these laws do not hold good because of the auroral zone. The auroral zone is a belt around the geomagnetic pole in which the Aurora Borealis occurs. The radius of this belt is approximately 1400 miles. At the centre of the belt, the Aurora, or Northern Lights, are most frequently observed and towards the inner and outer edges, the frequency of Aurora falls off.

"The geomagnetic pole is the magnetic pole of the earth that would be seen by an interplanetary observer. It is the magnetic pole the earth would possess at the surface if the earth's crust contained no ferrous materials. It is located on the West Coast of Greenland in latitude 78°N very close to a place called Etah. The auroral zone is symmetrically placed around this point, and the centre of the zone, or line of maximum occurrence of auroral light (about 1400 miles from Etah) runs through Churchill, Manitoba.

Influence of the Zone - A peculiar thing about the auroral zone is its influence on radio wave propagation. In the outer half of the zone, ie. from Churchill to Winnipeg, radio waves appear to be gently absorbed by it. Thus, transmitter powers much greater than usual are required for communication. The necessary increases are of the order of 100 to one in most cases. However, inside the zone, across the 2800 miles (approximately) of its diameter, no such absorption is observed regularly. Of course, periods of more or less intense absorption occur in the same manner as they do elsewhere in the world. But any attempt to communicate from inside to outside as, for instance, from Cambridge Bay to Washington, DC, is almost certain to give unsatisfactory results. Indeed, in a few isolated cases of this kind, the law of reciprocity, whereby radiated power from a transmitting aerial will cover an area equal to that covered by receiver sensitivity if the same aerial were used for receiving, has been known not to hold. In other words, a circuit, for example, from [Fort] Chimo to Yarmouth, NS, might be serviceable one way and not the other, when the same frequency is used for both transmitting and receiving. In addition, circuits which are tangential to the zone are seriously affected because of the longer time the radio waves are in the area of high absorption.

Extent of the Zone - If, on a globe, circles of radius 1400 miles and 2100 miles are described around Etah, Greenland, they will show the boundaries of the high absorption area which is commonly called the auroral zone. It will be seen that Canada is involved in this problem to a greater extent than any other country in the world, since most of our trans-continental or, indeed, any east-west, long-distance circuits such as Ottawa-Winnipeg-Vancouver pass through part of the high absorption area. The zone just skims northern Norway and northern Siberia, while the southern auroral zone lines entirely in Antarctica and presents no such problems to any country.

What is Being Done About It - Canada has recognized the necessity for a solution to this problem which is peculiar to Canada. The Canadian Radio Wave Propagation Committee (CRWPC) of the Defence Research Board (DRB) is engaged in finding out how communications may be made more satisfactory. There are six ionospheric recording stations now at work but it will be evident that no rapid solution will be forthcoming since the essence of the problem lies in the upper atmosphere between 50 and 200 miles above the surface of the earth.

The Magnetic Pole and Its Effect on Aircraft

"The magnetic pole is commonly believed to lie in the Boothia Peninsula on the northern coast of the mainland of Canada. It has been known for some time that its position varies, but in what directions or to what extent has remained more or less of a mystery. Perhaps part of the solution lies in the fact that the actual position or relatively small area in which the horizontal component of the earth's magnetic field is zero, varies with altitude. This is thought to be due to the magnetic materials in the earth itself which distort the earth's magnetic field. When the altitude is great enough, it seems likely that the observed position of the magnetic pole will not move with further increases in altitude and it will be found to be close to Etah in Greenland. The Aries, for instance, reported that the magnetic pole has moved to Bathurst Island after its now famous flight. But R.G. Madill of the Dominion Observatory took observations on the surface which were not only more accurate because of a steadier platform, but also were averaged over a much greater period of time. These showed beyond all doubt that the actual pole had moved only to Somerset Island, and indeed, was not very far removed from its former position.

The Effect of the Pole on Magnetic Instruments - The effect of the magnetic pole upon magnetic instruments in an aircraft is, of course, tremendous. In effect, it makes them completely unserviceable at the worst, which is right at the pole, and this effect becomes less as the aircraft gains a position farther and farther removed from the pole. It has been shown by the B29 group operating out of Edmonton, that within a radius of some 300 miles, roughly, of the surface position of the pole, magnetic instruments cannot be relied upon. Furthermore, this radius is to the south and west of the pole. In the opposite directions, the radius will probably be somewhat greater because of the trend of the pole to the north and east with altitude.

Difficulties with Non-Magnetic Instruments - The difficulty of producing a suitable gyroscopic compass such as a Brown or Sperry as used in ships is greatly increased for an aircraft because of the necessity for reducing the weight, coupled with the high speeds of aircraft and high altitude. These would make the correction factors too large to be applied automatically. Furthermore, should such a gyroscopic compass become available, its usefulness would almost inevitably become less as the true pole is approached - thus presenting a somewhat similar problem again, although for a different reason. There is, therefore, at the present time no suitable



Map 7-5: "Aries"
flight, May 1945.
Source: K.R.
Greenaway and
M.D. Gates, *Polar
Air Navigation: A
Record* (Ottawa: self-
published, 2009), 40.

steering device for aircraft flying within about 300 miles of the magnetic pole. Here is an example of the kind of errors a navigator might be faced with in attempting to use even the best magnetic instruments. The USS *Northwind*, which was with the USN Task Force 68 in the Arctic last summer, entered Lancaster Sound, she was stopped by pack ice in the western portion of the sound. She flew her aircraft off for a trip to Winter Harbour. This course took the aircraft across the line joining the previously reported position of the magnetic pole in Boothia, and the position newly reported by Aries in Bathurst Island. The Navigator, F/O Hickey of 9 Group, who was a Canadian observer with the Task Force, decided to try to check the Aries' observations. He plotted the magnetic meridians on the way over. They all pointed south at varying angles to the line joining the two reported positions of the pole, thus giving the impression that the position in Boothia was the correct one. On the return trip, however, he attempted to do the same thing, but all the magnetic meridians pointed north to the position in Bathurst Island. No conclusive evidence whatever was obtained.

What Is Being Done About It - The RCAF, in co-operation with DRB, has realized the tremendous problem that is involved in making aviation safe near the magnetic pole. Aircraft will be fitted suitably with various instruments and flown in the area so that the maximum of information about the pole itself can be obtained. This is being done on the well-known scientific principle of "observe, compare, deduce", in the hope that a suitable solution to the impasse will be discovered. It is badly needed.

Navigation in the Polar Regions

Navigation Instruments - The most annoying and serious problem that confronts a navigator in the Canadian polar regions is that of establishing and maintaining direction. As stated above, magnetic compasses are of little use within about 300 miles of the magnetic pole, and, of course, any suitable form of gyroscopic compass becomes less and less useful as the true pole is approached. Furthermore, such

refinements of these two instruments as the gyrosyn compass, which uses a “fluxgate” or electrically produced magnet for measuring the horizontal component of the earth’s magnetic field, plus a gyroscope, are of little use. When using the “fluxgate” this form of compass is subject to all the ills of the normal magnetic compass and when using the gyro only, suffers from the defects of the normal gyroscope. There are thus two sets of large and rapidly changing errors that apply, and these, coupled with the swinging that is characteristic of both instruments in this region, only tend to confuse the navigator.

Maps and Charts - As if this problem were not sufficient in itself, the fact is that most [of] the land areas in the Canadian Arctic are very poorly charted indeed. This makes contact flying, whether done visually or by either radar or magnetic means, a rather doubtful blessing. Once away from the tree line, radar is of limited use, but there is a magnetic device carried by Admiral Richard Byrd on his latest expedition to the South Pole which can show the outline of a coastline through thick layers of ice and snow. However, even this is relatively useless until more accurate charts have been produced.

Twilight - Another peculiar difficulty that besets the unwary navigator in the Arctic is twilight, during which his best aid, the astro-compass, is of no use to him. For example, an aircraft flying due west in latitude 77°20’N at 200 knots will traverse the same arc as the sun. This means that, at least to the navigator of the aircraft, time is standing still! He is in twilight where he cannot navigate by celestial means, and he stays there until he changes course or speed radically. Of course, flights should be planned not to coincide with twilight on the western courses, but this seems to be difficult to remember until it has been experienced once, after which it may be too late. At least one of the B29s lost in the Arctic last year was lost for this reason.¹

Conclusion

It is not within the scope of this paper to discuss the financial difficulties arising from the foregoing. However, some of the problems themselves have been outlined, and brief description of the measures now being taken to solve them, have been given. Although all these problems probably need not be undertaken by Canada alone, there are at least two that should—the auroral zone and the magnetic pole. These are peculiar to Canada and Canadian scientists, therefore, are probably in the best position to carry out the necessary research.

¹ *Editor’s note:* Presumably Wood is referring to B-29 Superfortress Kee Bird which had an emergency landing in Northwest Greenland during a spy mission on 21 February 1947 because there was “no means of steering as the sun was too low.” See the official government report at www.b29keebird.net.

SUMMARY

On re-reading all that has gone before in this work, the pertinent fact seems to be that the very first thinking on Polar Aviation problems was so incisive and far-seeing that the general views expressed do not differ greatly from the very latest views held to-day. In fact, the Polar Concept, as we know it and regard it as something rather new, was just as real in the mind of S/L R.A. Logan in 1922 as it is real and important in our minds today.

Between the time of S/L Logan's expedition to Ellesmere Island in 1922 and the present there have been many faltering steps taken and many mistakes made—fortunately very few fatal ones—and the lessons learned from mistakes made have been of enormous value. The Hudson Straits Expedition taught us much, as did the pioneer photo and mapping flights of such men as Mawdesley (now retired) and Slemon (now holding the rank of Air Vice-Marshal in the regular RCAF), and the epic flight of G/C Fullerton down the Mackenzie.

In the years that followed knowledge was gained on methods of survival by close association with trappers, [Hudson's] Bay Company personnel, the RCMP and natives—sometimes also by bitter experience, as did F/L Coleman when lost in 1936. Progress was also made in maintenance technique, servicing facilities and actual operating methods, whether it were flying itself, navigation, or photography and mapping.

This great wealth of experience paved the way for the work which was to follow and were it not for the unfailing courage and determination of these earlier pilots, observers and ground crew, much that has been done would have been impossible.

During the war great strides were taken in the development of Arctic aviation. Northern bases were constructed in the East at Gander, Newfoundland; Goose Bay, Labrador; Fort Chimo, in the Ungava peninsula; and Frobisher, on Baffin Island. Coastal Command squadrons operated in the far northern waters and Transport Command pushed its aircraft across the Atlantic and up the North West Staging Route to such sub-arctic places as Whitehorse and Snag, and further to Kittigazuit and Aklavik.

Now our efforts are turned northward again. It has become increasingly evident that our arctic areas must be developed and protected, and that it is our responsibility. The job is so gigantic that in some instances United States aid has been sought and received, but it is the policy of the Canadian government to replace such personnel with Canadians, when Canadian personnel are available.

Numerous operations and exercises have been carried out by all three branches of the service whose reports are made available, and the task of photography and mapping is an annual one for the RCAF in the summer months. However the greater knowledge gained serves to emphasize the need for still more knowledge of the Arctic, and so the work progresses till the motto of the RCAF might well be, instead of *Per Ardua ad Astra*, *Per Ardua ad Arcticum*.

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PER ARDUA AD ARCTICUM

The Royal Canadian Air Force in the Arctic and Sub-Arctic

Edward P. Wood

Wood's pioneering history, published here for the first time, offers valuable insights into the pivotal role that the Royal Canadian Air Force played in the opening of the Canadian North from the 1920s to the late 1940s. Filled with interesting first-person accounts of Arctic operations and rich descriptions of Arctic landscapes, *Per Ardua Ad Arcticum* is a valuable resource for scholars, military personnel, aviation enthusiasts, and general readers who want to learn more about the early history of the RCAF and aviation in the Canadian North.

