PISTONS TO PIPELINES: THE RELATIONSHIP BETWEEN AVIATION, OIL AND THE DEVELOPMENT OF THE NORTH

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Abstract

Infrastructure development in the North is tied directly to military and private explorations for oil, national defense, and the use of aviation that provided access to remote regions. World War II drove the initial infrastructure development in Northwest Canada and the North Slope of Alaska, which linked aviation to oil and provided access points for further Arctic development. The Cold War brought the military back to the Arctic, using existing infrastructure to construct the Distant Early Warning (DEW) Line, the largest construction project ever attempted in the North at that time. Aviation provided the transportation flexibility necessary to accomplish the project and expanded aviation infrastructure in the North. All of this coalesced with the exploration and discovery of oil at Prudhoe Bay and the subsequent airlift that allowed rapid development of the oil field.

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Chapter 1 Introduction

In August 1942, a group of twenty pilots from the 7th Ferrying Command strapped into their P-40 Warhawks, a single-engine fighter aircraft rapidly becoming obsolete, at Great Falls, Montana. The flight of twenty aircraft with orders to Anchorage, Alaska, became the largest single movement to date along the Northwest Staging Route, still in its infancy. As the flight progressed north, a thin cut in the forest below, the Alaska Highway, began to take shape. Northeast of Whitehorse, crews worked to build a pipeline from Norman Wells to eventually supply the air route with fuel. At the end of the route, nineteen aircraft made it to Fairbanks, one having crashed en route, one during landing at Ladd Field. Unlike later flights, construction crews had yet to carve out emergency strips between the airfields.[1]

The Japanese attack on Pearl Harbor on December 7, 1941, plunged the unprepared United States into a global war. Alaska, America's Arctic outpost, stood relatively defenseless, with a minuscule defense force of roughly 22,000 service members to protect over 665,000 square miles of territory.[2] Slow to take hold in Alaska compared to the rest of the United States, aviation infrastructure development lagged a decade behind the rest of the country. Petroleum development in Alaska proved to be equally as underdeveloped, with almost non-existent production. The fortification that occurred during World War II forever altered the trajectory of Alaska.

The Japanese attack against the United States spurred changes in orders of magnitude that forever impacted military, aviation, and petroleum development in the North. The resulting

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[1] Blake W Smith, *Warplanes to Alaska* (Blaine, WA: Hancock House, 1998), 69.
[2] Joel L Klein et al., *World War II in Alaska: A Historic and Resources Management Plan: Final Report* (Anchorage, AK: U.S. Army Corps of Engineers, Alaska District, 1987), 2-17.

defense mega-projects in the North coalesced with the discovery of oil at Prudhoe Bay in 1968 and with the construction of the Trans-Alaska Pipeline. The United States went from having almost no presence in the Arctic to developing a world-class oil field in just over thirty years. The development of aviation infrastructure throughout the North brought about by global conflict allowed rapid oil exploration and construction of the Prudhoe Bay oil province.

The necessity to provide oil to American and Lend-Lease aircraft moving across Northwest Canada and Alaska, as well as provide alternate petroleum sources for the United States Navy, drove the frenetic search for oil north during World War II. National security concerns during the Cold War necessitated large-scale construction and development across the North American Arctic. The discovery of oil at Prudhoe Bay rested on decades of Arctic military expertise, environmental knowledge, and aviation infrastructure. Aviation in the North needed a reliable fuel supply, creating the need for exploration and development. Aviation and global conflict created the foundation for the discovery and development of the Prudhoe Bay oil field. Following a bell-curve-like model, the use of aviation in the North increased from the start of World War II, reaching its apogee by 1969 after the discovery of oil and declined as construction plateaued and the Haul Road became the primary method of moving cargo north.

Between World War II and the construction of the Trans-Alaska Pipeline, the United States military and the oil industry developed vital and modern aviation infrastructure in the North. Aviation provided access to the North, and the infrastructure that followed further expanded development and access. Oil companies used the existing infrastructure to explore and accelerate the development of the Prudhoe Bay oil field. Military projects for national defense and oil companies worked in concert to develop a modern aviation infrastructure still in use in the North. This research analyzes and connects four major twentieth-century construction projects in the North with aviation infrastructure development. Each project advances aviation technology and techniques in the North that are used in the next project, culminating in the construction of the Trans-Alaska Pipeline.

Aviation arrived in Alaska on July 3, 1913, in Fairbanks, slightly less than ten years after the Wright Brothers' first powered flight at Kitty Hawk, North Carolina. The Martin Tractor Aeroplane made a series of flights over the next three days attempting to generate interest in aviation, or so the promoters hoped.[3] Viewed by locals as nothing more than a spectacle, it would not be until the summer of 1920 before the next aircraft arrived over the interior of Alaska. The Alaska Air Expedition, better known as the Black Wolf Squadron, flew from New York to Nome and back to demonstrate the strategic capabilities of aviation and the strategic position of Alaska as a gateway to Asia. Ten years to the day after the Martin Tractor Aeroplane first flew in Fairbanks, Ben Eielson, a local Fairbanks school teacher, took to the air on July 3, 1923. With Eielson's flight, aviation as a viable mode of transportation finally took off in Alaska.

This thesis extensively utilizes the terminology North. The "North or the "Circumpolar North" has numerous and overlapping definitions. The North is not monolithic in that it has a diverse group of inhabitants, climactic conditions, vegetation, and political boundaries. These divisions do not make for a definitive definition of the North. For this study, the North is generally defined as the region above 55 degrees north latitude in North America. Although the Northwest Staging Route extends below this, starting in Great Falls, Montana, the major

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[3] Julie Decker and Jeremy Kinney, *Alaska and the Airplane: A Century of Flight* (Salenstein, Switzerland: Braun Publ., 2013), 9.

exploration and construction projects that are the focus of this research occur north of the 55th Parallel, which encompasses the majority of the projects discussed in this thesis.

The airplane found a ready customer in the mining industry. What could take weeks to reach by traditional methods of transportation, the airplane could reach in an hour or two. Gold mines became the determining factor for the location of new runways across the state in the 1920s and 1930s.[4] Aviation had become so popular that the Alaska Road Commission began carving out runways across the territory. Aviation still lagged behind that of the lower 48 states, with little federal support for infrastructure development. That all changed in the late 1930s as war loomed on the horizon.

War and oil became the two most significant drivers in aviation infrastructure development in the North. Seeking to alleviate pressure on West Coast refineries, both the Army and Navy drilled and explored for oil. The Army developed the first petroleum pipeline in the North, paving the way for future pipelines culminating in the construction of the Trans-Alaska Pipeline. The Canol Pipeline Project sought to refine Canadian crude oil and provide fuel along the Northwest Staging Route (NWSR) and the Alaska Military Highway (Alcan).[5] The Navy explored the Naval Petroleum Reserve No. 4 (Pet 4) north of the Brooks Range in Alaska in search of commercial quantities of oil. The Navy integrated aviation into every facet of transportation and daily operations. Unlike Canol, which relied on numerous modes of transportation, Pet 4 relied almost exclusively on aviation for logistical support.

[4] Dirk Tordoff, "Roads Versus Runways," in *The Big Wild Soul of Terrence Cole: An Eclectic Collection to Honor Alaska's Public Historian*, ed. Frank Soos and Mary F. Ehrlander (Fairbanks, AK: University of Alaska Press, 2019), pp. 287-308, 299.
[5] Canol is an acronym for Canada Oil.

Infrastructure developed by the Navy and experience gained during year-round aviation operations on the North Slope allowed immediate access to the Arctic during the Cold War in the 1950s. The United States, in partnership with Canada, constructed the Distant Early Warning (DEW) Line, a string of radar stations across the Arctic, in less than three years. Existing infrastructure built by the Navy on the North Slope eased the logistical burden for builders. Canada, having neglected its far-North had to build new facilities and increase its air-cargo industry to accommodate construction needs. The resulting airlift in Alaska created new infrastructure and aviation experience that directly played a role in the exploration and development of Prudhoe Bay. Enhanced by new aviation technology, aviation became the main form of transportation until the creation of the Haul Road from Livengood to Prudhoe Bay.

Oil production is one of the dominant economic drivers in Alaska due to the Prudhoe Bay oil field and the pipeline. Aviation accelerated the pace of exploration and development of oil infrastructure in the North. The aircraft and pilot tend to be the focal points of interest, but they are part of a much larger system created to support development, whether government or civilian. This research ties together four major construction projects in the North by looking at aviation usage. Each project's aviation infrastructure directly supported the next project and spurred rapid development. Each chapter analyzes aviation's contribution in the North that is missing from the current body of Northern aviation scholarship.

Chapter 2 will demonstrate the interconnectedness of aviation and oil in the North during World War II. The United States Army built a road connecting the airfields to support the Northwest Staging Route. Providing fuel along the route proved to be highly inefficient. Moving fuel by aircraft consumed more fuel than they hauled, and vehicles consumed large quantities of the fuel they carried. The Army began construction on the Canol Pipeline Project to connect the oil field at Norman Wells, Northwest Territories, Canada, to Whitehorse in the Yukon for refining. The Army built three additional pipelines connecting Skagway, Whitehorse, Watson Lake, and Fairbanks with refined fuel. The Army's attempt at refining oil in the North failed. Cost overruns, construction delays, leaks, and the ousting of Japan from the Aleutians conspired to cancel the project. Aviation became the catalyst for these wartime mega-projects spurred on by the exigencies of war. More importantly, Canol proved the viability of petroleum pipelines in the North, becoming the foundation for every pipeline that came after.

Chapter 3 demonstrates oil exploration's dependence on aviation for logistics and movement support. In June 1944, the United States Navy explored the Naval Petroleum Reserve No. 4 (Pet 4) in northern Alaska, searching for commercial quantities of oil and gas. Like the Army, the Navy wanted another oil source to feed its Pacific fleet. The first widespread use of aviation for oil exploration in the North allowed the Navy to traverse vast distances in a short amount of time. Aviation made the North Slope accessible in a way no other form of transportation could during the Navy's tenure searching for oil. With the runway constructed at Barrow, isolated workers could reach Fairbanks in a few short hours.[6] Aviation became the only year-round transportation method the Navy had, allowing it to sustain multiple teams in the field across vast distances. The use of aviation became so prolific that it became commonplace and part of the background while moving thousands of tons of cargo per year. Transportation routes and techniques developed by the Navy and its contractors transferred directly to the DEW Line construction. Infrastructure created by the Navy at Bettles, Umiat, Barrow, and Barter Island heavily influenced DEW Line construction and oil exploration at Prudhoe Bay.

[6] In 2016 residents of Barrow voted to change the name of the town back to the traditional Inupiaq name of Utqiagvik. For the sake of this thesis, Utqiagvik will be referred to as Barrow to maintain consistency with the source documents.

Chapter 4 details the events that occurred after the Navy ended its exploration for oil on the North Slope. The Air Force assumed control of the Navy infrastructure to support the construction of the Distant Early Warning Line. Only twenty-five percent of the DEW Line was in Alaska; most of the construction effort occurred in Canada. The chapter demonstrates how the largest airlift in Northern history expanded transportation infrastructure, demystified the North, and made travel to the Arctic commonplace. Chapter 4 examines the differences between construction in Alaska and Canada. Alaska benefited from being an American territory, and the military operated as they pleased in concert with civilian air carriers. Ever cautious about protecting its sovereignty, Canada forced the United States to use Canadian air carriers. Ultimately the Canadian aviation industry grew after stumbling at the beginning. The construction of the DEW Line proved the viability of large-scale construction projects in the Arctic and, in doing so, progressed the development of airfields, flight tracking, and navigational aids for aircraft.

Chapter 5 demonstrates how the discovery of oil in Alaska benefitted from existing infrastructure and transportation methods created during the exploration of Pet 4 and the construction of the DEW Line. Oil companies expanded upon existing transportation infrastructure and adapted emerging helicopter technology to meet the demands of oil field development. When congress rescinded Public Land Order 82, it opened up lands surrounding the Naval Petroleum Reserve No. 4 for exploration. For the first time, northern oil exploration and construction projects benefitted from technologically advanced transportation aircraft adapted from the military. Unlike the DEW Line, which depended on antiquated aircraft for support, the development of Prudhoe Bay sat at the crossroads of modern aviation technology and high demand for oil. With the construction of the Haul Road north of Fairbanks, transportation began shifting to cheaper ground-based means. Regardless, aviation still provided the fastest year-round means of transportation to the northern oil fields.

Aviation accelerated the pace of development in the North and provided access points for further development. The major construction and development projects in the North progressed with aviation technology that made travel to the Arctic routine. Private oil companies and the United States military became the main drivers of Northern aviation infrastructure development. Advances in aviation technology sped up the pace of construction and development on the North Slope, allowing oil companies to rapidly explore and develop the oil field at Prudhoe Bay. Innovation in transportation technology became vital to resource development in the North.

1.1 Literature Review

The literature review examines key petroleum and aviation literature pertaining to Northern construction projects between World War II and the completion of the Trans-Alaska Pipeline. Civil and military aviation literature on this era tends to focus on the pilot and aircraft or larger military campaigns. These sources provide anecdotal references to oil exploration or construction support in the broader story of the pilot or organization. Literature on large-scale construction projects and oil exploration in the North does mention aviation and praise its contributions but falls short of detailing its broader impacts on the project's success. What scholarly literature does exist on aviation examines perceptions of aviation and the culture within the industry in Alaska.

Journalist Jean Potter's book *Alaska Under Arms* provides an overview of the military preparedness of Alaska prior to the Japanese invasion of the Aleutian Islands. Potter contends that the United States government, slow in its recognition of the strategic value of Alaska, rushed to fortify the territory in the face of a growing Japanese threat.[7] She explains the haphazard nature of the military build-up in Alaska and the transportation issues in a territory lacking appropriate infrastructure. Potter explains the necessity of an overland route logistically connecting the Canadian airfields and highlights the politically charged rationale for route selection. The author also describes the conditions on the ground, taking care not to criticize military efforts and putting a positive tone to the situation reminiscent of propaganda films. Potter wrote this book without the benefit of decades of perspective; therefore, no analysis linking aviation and development occurred.

The Alaska Highway in World War II: The U.S. Occupation in Canada's Northwest by Ken Coates and William Morrison explores the impact of the defense projects carried out by the United States in Northwest Canada.[8] It focuses more on the societal and environmental changes resulting from the American occupation. Like Potter, Coates, and Morrison provide a glimpse into the rationale surrounding the construction of the Alcan and Canol Pipeline. The authors contend that the intention of any constructed highway would be to provide logistics support along the air route to Alaska. To provide fuel for the entire operation, the Canadians unenthusiastically agreed to the construction of the Canol Pipeline, which tied into the air route. Stetson Conn and Bryon Fairchild argue similarly in *The Framework of Hemisphere Defense* that the Alcan would serve as an overland road to serve as a guide path for fliers and a means to more readily improve the airfields along the staging route.[9]

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[7] Jean Potter, *Alaska Under Arms* (New York, NY: Macmillan, 1942), 39.
[8] Kenneth Coates and William R. Morrison, *The Alaska Highway in World War II: The U.S. Army of Occupation in Canada's Northwest* (Norman, OK: University of Oklahoma Press, 2015), 9.
[9] Stetson Conn and Byron Fairchild, *The Framework of Hemisphere Defense* (Washington, DC: Office of the Chief of Military History, Dept. of the Army, 1960), 394.

Further exploring the major construction projects in Northwest Canada, *The Working North: Labor and the Defense Projects 1942-1946*, by Coates and Morrison, explores the labor history of Canol, the Alcan, and the Northwest Staging Route. They argue that the defense projects sat at a pivotal time in labor history between the worker exploitation of the late nineteenth and early twentieth centuries and the highly paid workers who built the Trans-Alaska Pipeline. Like *The Alaska Highway in World War II*, the authors refer to the American presence in Canada as an invasion and occupation and keep that theme throughout their work. Coates and Morrison also argue that Canada's general neglect of the North heightened the American sense of vulnerability. Stanley Dziuban, a military historian in the United States Army, largely glances off any labor unrest or friction between the two countries in *Military Relations Between the United States and Canada, 1939-1945*. He argues that any friction or misunderstandings proved insignificant when measured against the two country's accomplishments and cooperation. Both works provide different perspectives on the same issues, but Dziuban's work focuses mainly on military relations and the United States' involvement across Canada.

While the Army toiled in Northwest Canada, the Navy explored for oil in Northern Alaska. *Exploration of Naval Petroleum Reserve No. 4 and Adjacent Areas, Northern Alaska 1944-53* by John C. Reed provides a year-by-year report of the Navy's exploration of Pet 4. Reed's document has proven to be the most robust source of information regarding aviation usage for the exploration in that it briefly explains aviation operations each year. In search of oil, the Navy did not set out to spearhead new ways of using aviation to support exploration or develop infrastructure that supported activities for decades to come. Hence, Reed did not reflect upon this in his writings. The report goes into greater detail on exploration, drilling activities, and other issues pertinent to the search for commercial quantities of oil. Reed does mention, for the first time, the necessity for a pipeline to move oil in the event of a major discovery to connect to rail, airfields, trucking, and tankers at Valdez.[10]

The U.S. Navy Seabee Alaskan Oil Expedition, 1944 by Kenneth Bingham, contains the deployment book for the Construction Battalion Detachment 1058, the sailors who conducted the initial exploration during World War II. Bingham states, “Adequate air support was essential. High priority was given to the construction of an airstrip at Barrow.”[11] Bingham, like Reed, covers the same events during the initial exploration but provides more detailed information on the activities of Detachment 1058 from the worker’s perspective. Much of the book reads like a yearbook to commemorate the unit’s time in Alaska but still provides context and information left out of a report like Reed’s. Aviation is mentioned numerous times throughout the book anecdotally. Coupled with Reed’s work, a picture emerges of how aviation enabled those on the ground to develop infrastructure and support exploration across vast distances in the winter. With exploration coming to an end in 1953, the Air Force began to assume control of Navy property to support construction projects leading to the DEW Line.

The development of Alaska’s North Slope allowed open access via Fairbanks for crews and equipment moving north to construct the DEW Line.[12] *Dew Line: Distant Early Warning, the Miracle of America’s First Line of Defense* contends that the United States enjoyed immediate access to the Arctic while Canada lacked the infrastructure to move equipment north. As a result, the 2,000-mile-long line across the Canadian Arctic required “One of the greatest

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[10] John C. Reed, *Exploration of Naval Petroleum Reserve No. 4 and Adjacent Areas Northern Alaska, 1944-53* (Washington, DC: United States Government Printing Office, 1958), 28.
[11] Kenneth E. Bingham, *The U.S. Navy Seabee Alaskan Oil Expedition, 1944* (Ventura, CA: Binghamus Press., 2011), 1,2.
[12] Richard Morenus, *DEW Line; Distant Early Warning, The Miracle of America's First Line of Defense* (New York, NY: Rand McNally, 1957), 91..

airlift projects the world had ever seen."[13] The author provides a narrative of the conception of the DEW Line, its construction, and the cooperation required between the United States and Canada. *Armed Forces on a Northern Frontier: The Military in Alaska's History, 1867-1987* by Jonathan Nielson, also highlights how the United States benefitted from immediate access to the North and the importance of the existing facilities at Barrow.[14] As a result of the increased footprint at Barrow, it became the administrative center for the entire DEW Line network. Morenus dedicates a chapter to the airlift but tells more of exploits rather than analyzing how aviation fits into the larger transportation apparatus moving equipment north, while Nielson makes no mention of aviation. *DEW Line* does provide a glimpse of the different aviation assets involved in the airlift, their uses, and the challenges crews had to overcome to operate in the North.

The majority of the DEW Line sat on Canadian soil. Aviation played an important role in the development of the Canadian North and challenged and strengthened Canadian sovereignty. Historians P. Whitney Lackenbauer and Daniel Heidt analyze the intersection of aviation and sovereignty in the Canadian North in their article "Sovereignty for Hire: Civilian Airlift Contractors and the Distant Early Warning (DEW) Line, 1954-1961." They argue that the northern airlift dramatically expanded Canadian aviation capabilities by securing guarantees from the United States to use Canadian carriers to the fullest extent possible. In doing so, it grew Canadian commercial aviation, strengthening Canadian Arctic sovereignty.[15] This article explores how Canadian aviation, initially caught flatfooted by the airlift, struggled to meet the

[13] Ibid., 92.
[14] Jonathan M. Nielson, *Armed Forces on a Northern Frontier: The Military in Alaska's History, 1867-1987* (New York, NY: Greenwood Pr., 1988), 188.
[15] P. Whitney Lackenbauer and Daniel Heidt, "Sovereignty for Hire: Civilian Airlift Operators and the Distant Early Warning Line, 1954-1961," *Canadian Aerospace Power Studies* 4 (2012): pp. 95-112, 96.

demands placed upon it. The United States Air Force, which had free reign over air cargo movements in Alaska, had to acquiesce to Canadian requirements and diplomacy to keep cargo moving north. *Dew Line* provides a narrative with little analysis; Heidt and Lackenbauer explain the civil and military implications of a developed Canadian air cargo industry.

The construction of the DEW Line in Alaska rested on the shoulders of infrastructure built by the Navy during World War II. Naval oil exploration proved oil existed on the North Slope, but the quantity remained a mystery. The DEW Line proved the feasibility of large-scale construction projects in the Arctic, paving the way for commercial exploration of the North Slope. *Crude Dreams: A Personal History of Oil & Politics in Alaska* by Jack Roderick examines the relationship between Alaska and oil from the author's perspective. Jack Roderick provides a historical narrative and the politics that shaped the oil industry in Alaska. When the federal government rescinded parts of Public Land Order 82, oil companies became interested in the North Slope. Roderick explains how companies like British Petroleum and Sinclair picked up where the Navy left off, even using old Navy drilling equipment to drill test wells. The author rarely mentions aviation but provides context and the connections between the major northern construction projects that allowed for the rapid exploration and development of Prudhoe Bay. Moving north from Umiat, Roderick recounts how the newly formed Atlantic Richfield Company, ready to call it quits, discovered oil. With this backdrop, oil rigs, equipment, and camps moved entirely by aircraft descend up Prudhoe Bay.

Author Joseph Earl Dabney and his book *Herk: Hero of the Skies*, a history of the C-130 dedicates a chapter to the use of C-130s and the civilian variant, the L-100, in Alaska, supporting oil development. Dabney argues that Alaska Airlines, which leased the first L-100 from Lockheed for thirty days, pioneered the use of the aircraft in Alaska. He further states that single aircraft moved over one million pounds of equipment in what became known as "the 30-day miracle."[16] Dabney, a Lockheed public relations officer, provides a first-person look at the day-to-day operations of the C-130 in Alaska, riding along with Alaska International Airways (AIA) crews supporting the oil field. The author provides detailed information on C-130 operations at the micro level while highlighting the aircraft's ability to move entire camps and drill rigs across the state to accommodate changing priorities. In his book *Triumph Over Turbulence*, James Magoffin, AIA's founder, similarly argues that Alaska would be the ideal location for C-130s. The discovery of oil increased the demand for aircraft; however, the delay in pipeline construction hampered the company's ability to use its C-130 fleet.

Aviation is a critical mode of transportation in the North. Twentieth-century oil exploration and military construction projects benefitted from the use of aviation, which drove the development of critical infrastructure, which is still in use. Current scholarship has yet to examine the role aviation has played in the development of Northern infrastructure and the relationship between aviation and oil in the North. This research addresses this gap by examining the use of aviation in large-scale Northern construction projects and how the first petroleum pipeline, constructed in large part to support aviation, became the foundation for all other Northern pipelines. This thesis connects aviation to the four major Northern construction and exploration projects of the twentieth-century culminating with the construction of the Trans-Alaska Pipeline.

[16] Joseph Earl Dabney, *Herk: Hero of the Skies* (Lakemont, GA: Copple House Books, 1979), 238.

1.2 Methodology and Literature Gap

This research used historical research methodology to analyze primary and secondary sources to interpret and construct a narrative that explains the change over time that occurred in the North between World War II and the construction of the Trans-Alaska Pipeline. Government and military documents and newspaper articles served as primary source material, while journal articles, histories, and narratives provided vital information as secondary sources. Analyzing these primary and secondary sources identified common themes between the four major construction projects researched for this thesis. Global conflict, aviation, petroleum, infrastructure development, and the interplay between private and governmental entities became areas of research to identify the change over time that occurred.

To understand the breadth of the topic, secondary sources such as narratives based on historical facts provided an overview and timeline of each major project. With the scope of the timeline understood, research of primary sources provided factual information and context to develop and connect identified themes. Research conducted in the field by visiting sites identified in this thesis also provided needed context by understanding conditions on the ground. Cross-referencing newspaper articles against other primary and secondary sources helped to identify research gaps and irregularities to understand how and when events occurred. Refinement of ideas and additional research of primary and secondary sources continued throughout the writing process as the narrative began to take form.

Oral histories conducted in person and from the University of Alaska Fairbanks' Project Jukebox provided details on key individuals, organizations, and events researched for this thesis. The use of photographs and archival video footage from the Alaska and Polar Regions Collections and Archives (APRCA) provided details and helped confirm other information sources. As a pilot, having flown to many of the locations researched in this thesis provided an in-depth understanding of the topography and conditions at each site. Documents on the Canol Project from the Northwest Services Command on microfiche housed in the APRCA provided invaluable information to construct a factual narrative on the Canol Pipeline.

This thesis started with trying to understand the connection between aviation, oil, and aviation infrastructure development in the North and how it led to the construction of the Trans-Alaska pipeline. As research progressed, four major projects emerged as key moments in 20th-century Northern history as they pertained to aviation, oil, and infrastructure. The use of primary and secondary sources identified how common aviation infrastructure from each era supported the next phase in Northern development. This research showed the connection between Northern construction projects during World War II for aviation and oil and the Trans-Alaska Pipeline. The connections provided a basis for the main arguments of this thesis. With an established argument, it provided guidance for refining sources and direction for additional research.

1.2.1 Literature Gap

Aviation literature in the North tends to focus on the pilot and the aircraft and not their contributions to the overall development of the North. When petroleum exploration or development is mentioned, it is often anecdotal or in passing, tending to focus more on the perceived challenge of the Northern environment. Likewise, with literature on Northern petroleum or pipeline literature, aviation, when mentioned, is rarely connected to development. Authors typically depict aviation as an activity taking place in the background. Aviation and oil are closely interconnected, and this thesis bridges the gap tying oil exploration in the North directly to aviation.

Chapter 2 Oil for Aviation in the North

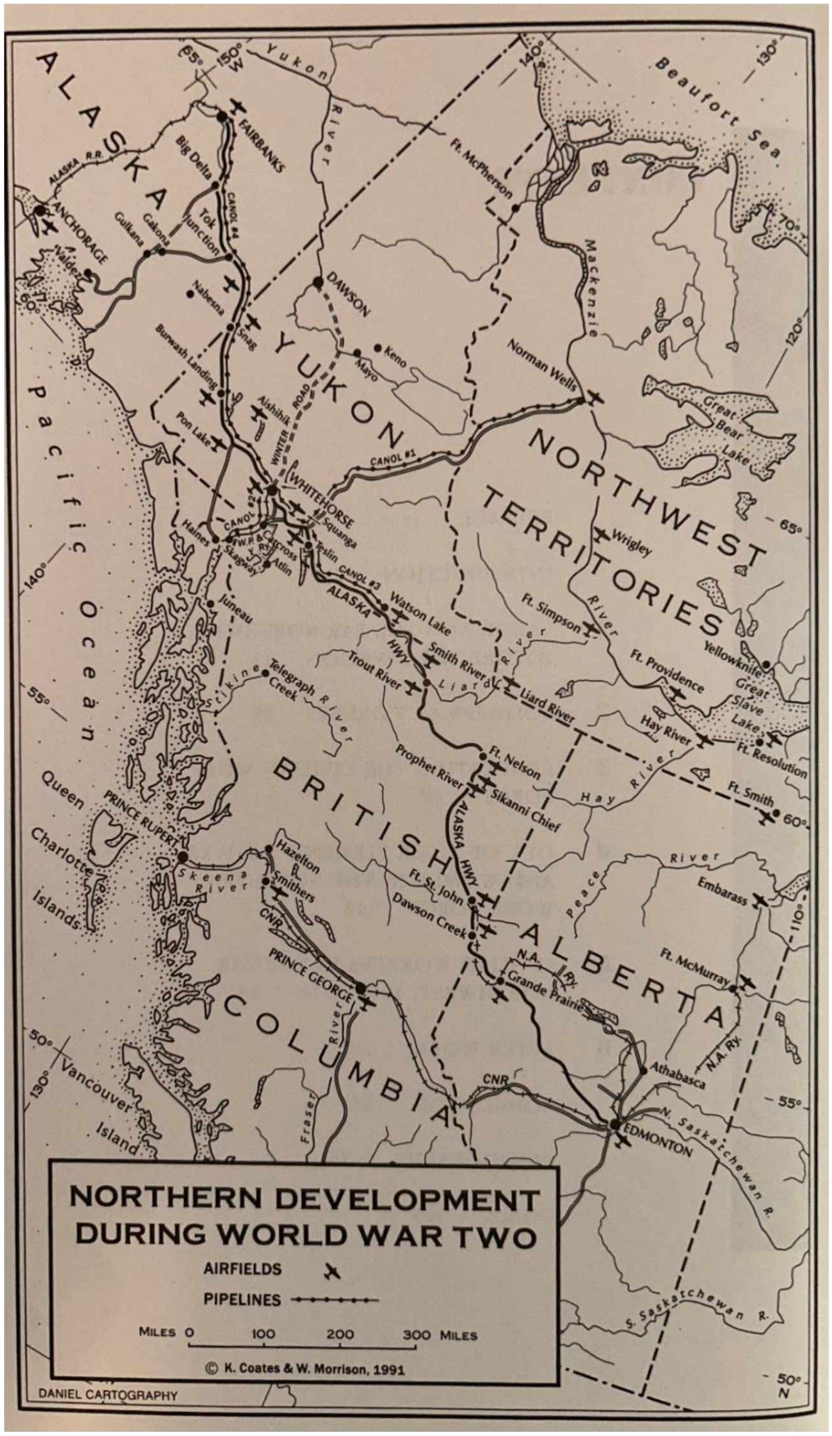

Figure 1. Northern Development during World War Two. William R. Morrison and Kenneth Coates, Working the North: Labor and the Northwest Defense Projects, 1942-1946 (Fairbanks, AK: University of Alaska Press, 1994), viii.

2.1 Introduction

Second Lieutenant A.D. Wickett made a final check of the instrument panel before pushing the throttles of his A-20 Havoc full open. One hundred octane high-grade aviation fuel ignited inside the Wright R-2600 cylinders giving the medium bomber maximum power for the takeoff roll. Lieutenant Wickett led a flight of six A-20s from Great Falls, Montana, on August 31, 1942, to their next stop in Edmonton, Alberta, Canada, each aircraft consuming approximately 400 gallons of fuel during each flight. These A-20s represented the first six aircraft of 7,926 to be transferred to the Soviet Union as part of the Lend-Lease Act.[17] The aircraft went on to help stop the Nazi juggernaut on the Eastern Front.

This chapter will demonstrate the relationship between aviation and oil in Northwest Canada and Alaska during World War II through the construction of the Canol Pipeline Project. The pipeline project expanded beyond the original pipeline from Norman Wells, NWT, Canada, to Whitehorse, YT, Canada, into four pipelines that moved fuel as far as Watson Lake, YT, Canada, in the south, to Fairbanks, Alaska, to the northwest. The Army with the Canol Pipeline Project showed the feasibility of oil pipelines in the Arctic. Coupled with the widespread use of aircraft and the airlift of heavy equipment to the North Slope demonstrated in subsequent chapters, it laid the groundwork for the development of the Prudhoe Bay oil fields and the construction of the Trans-Alaska Pipeline. This chapter will also show that the United States Army built the Alaska Highway to connect the airfields in Canada and Alaska to support Lend-Lease aircraft movements along the Northwest Staging Route (NWSR). These three efforts comprised an extensive militarization of the North that accelerated when the Japanese invaded the Aleutian Islands. This chapter will connect aviation to these three significant construction

[17] Smith, 105.

projects and explain how fuel scarcity created the need for organic fuel sources, the reasons for the construction of the Alaska Military Highway, the Canol Pipeline Project, and the legacy of these projects.

In all, the Army built four pipelines as part of the Canol Pipeline Project. Canol 1 moved crude oil from Norman Wells, Northwest Territories, Canada, to Whitehorse, Yukon Territory, Canada. Canol 2 laid alongside the North Pass Railroad, connected Skagway, Alaska, to Whitehorse, and moved refined fuel for use along the NWSR. Canol 3 extended south from Whitehorse to the airfield in Watson Lake, Yukon Territory, Canada. Canol 4 moved fuel from Whitehorse to Fairbanks, Alaska. This chapter will also show that most of the fuel consumed along the NWSR came from the United States via barge to Skagway.

The United States constructed the Alaska Highway to provide logistical support to the airfields along the NWSR.[18] With the war raging in Europe and the Pacific, the United States lacked the transport aircraft capability to supply airfields along the route at the onset of the war. Construction of the Alaska Highway had been discussed numerous times before the war but became a reality after Japan attacked Pearl Harbor. Existing histories of the highway focus on the engineering and construction of the route and exaggerate the route as a means to defend Alaska in the event of a large-scale attack. In reality, when the Army announced the completion of the highway, some doubted the ability to traverse the newly constructed pioneer road.[19] Spring floods in 1943 washed out major sections of the pioneer road, further degrading its ability to move large quantities of cargo.

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[18] P.S. Barry, "'Punch' Dickins and the Origin of Canol's Mackenzie Air Fields," *Arctic* 32, no. 4 (January 1979): pp. 366-373, 367.
[19] Coates, Morrison, 52.

2.2 War Construction in the North

Alaska has a long history as a military backwater. Military planners had long understood the importance of Alaska. Still, the territory sat on the strategic back burner until control of the North Pacific against Japan's threat forced the United States to act. Brigadier General William "Billy" Mitchell, the Army's first airpower advocate, understood Alaska's geographic significance and argued that Alaska was the "air crossroads of the world."[20] To fulfill Mitchell's prophecy, Alaska required infrastructure and a logistical support network hacked out of boreal forest and permafrost, which needed fuel.

With the world at war, three significant projects began in Alaska and Canada to support the United States and Soviet war efforts. The Northwest Staging Route, the Alaska Highway, and the Canol Pipeline Project. The highway and the pipeline existed to support aviation operations along the staging route.[21] Popular literature on the Alaska Highway likes to tout the conquering of the northern forests and routinely glosses over the factual reasons that created the need for the highway, aviation. Often hidden or considered an adjunct to the highway and staging route, the Canol pipeline has similar origins. Modern aircraft require high-octane fuel in staggering quantities. Petroleum refining capabilities along the staging route would solve the issue of providing fuel in large enough quantities for the aircraft. Like the Alaska Highway, the reason for constructing the pipeline gets lost in the larger engineering marvel narrative.

The Northwest Staging Route started as a primitive connection of airfields through Canada. Pioneered by Grant McConachie and his Yukon Southern Air Transport company in 1937, rudimentary airfields popped up between Edmonton and Whitehorse at Fort St. John, Fort

[20] John Haile Cloe and Michael F. Monaghan, *Top Cover for America: the Air Force in Alaska, 1920-1983* (Anchorage, AK: Anchorage Chapter-Air Force Association, 1987), 1.
[21] Nielson, 138.

Nelson, and Watson Lake, all in Canada.[22] These airfields lacked solid surfaces that allowed year-round use. During spring breakup, landing strips were often unusable for weeks until the soggy ground dried and could accommodate the weight of bush planes. It would not be until 1940 when the Canada-United States Permanent Joint Board of Defense (PJBD) recommended an upgrade to the airway between Edmonton and the Canadian border with Alaska as a defense measure in the event of a Japanese attack.

The remote nature of these airfields posed a logistical challenge for fuel transportation. No good road network existed in northern Canada to connect these towns. Bush pilots regularly paid exorbitant prices for fuel. Fuel refined along the west coast of the United States moved by ship up the coast and through the Lynn Canal to Skagway and into Canada via the White Pass & Yukon Railroad to Whitehorse. Other routes brought fuel through Wrangel, Alaska, or by rail to McMurray, Alberta, Canada, and down the Athabasca River. Regardless of the destination, fuel deliveries depended on the time of year and the weather. The price of fuel became another issue. In Whitehorse, residents paid .80 cents per gallon. In Watson Lake and Fort Nelson, they paid as high as $1.25. [23] Prices in the United States at the time ranged between 18 and 20 cents.[24]

2.3 Resource Scarcity

As airfields along the route began to take shape and construction progressed, planners forecasted initial aviation-grade fuel requirements for each field. The Air Corps representatives for the United States on the PJBD estimated that each airfield would require tens of thousands of gallons. The Americans passed this estimate to its Royal Canadian Air Force (RCAF)

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[22] Smith. 31.
[23] *The Canol Project*, vol. 1 (Washington, DC: Northwest Service Command, 1945), 31.
[24] "Fact #915: March 7, 2016 Average Historical Annual Gasoline Pump Price, 1929-2015," Energy.gov, March 7, 2016, https://www.energy.gov/eere/vehicles/fact-915-march-7-2016-average-historical-annual-gasoline-pump-price-1929-2015.

counterparts for input. Commodore Cuffe, the commander of the Eastern Air Command for the RCAF, replied that Canada did not have the capability to refine 100-octane aviation fuel, so other supply methods would have to be found.[25] So went life along the Northwest Staging Route during the early construction. Resource scarcity and lack of reliable transportation methods made it difficult to move existing supplies across the under-developed expanse of northern British Columbia and the Yukon Territory.

In 1938, the United States Army Air Corps adopted 100-octane fuel as the standard for aviation operations. Aircraft became highly sophisticated in the 1930s with improved engines, constant-speed propellers, and bigger airframes. Fuel grade and performance went hand in hand. Pilots started noticing the differences in fuel performance as far back as World War I. Fuel octane had yet to be understood; fuel from Java and Sumatra proved better than the U.S.-supplied fuel at the time.[26] The higher-grade fuel reduced the instances of pre-ignition in the cylinders, which created a knocking sound. This knocking produced higher temperatures in the engine and reduced performance, a deadly combination in combat.

Another aspect of the fuel supply problem resided in the barrels themselves. The United States had to drastically increase the production of steel, iron, and other materials to meet the growing demand that war created. Aircraft, ships, tanks, and other vehicles competed for the same resources as wartime production went from a standstill to a sprint. Compounding this problem, the American tanker fleet fell prey to German submarines and outpaced the United States' ability to build them. Resource scarcity impacted the United States' ability to produce these one-time-use steel barrels. They needed a new transportation method.

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[25] Ibid., 32.
[26] Graham White, *Allied Aircraft Piston Engines of World War II* (Warrendale, PA: SAE International, 1995), 3.

What is more, the standard weight of a 55-gallon barrel of aviation fuel topped out at 330 pounds. The steel used for the barrel accounted for eighty of those pounds.[27] Planners had considered the use of transport aircraft as a primary means of fuel transportation. While their use supplemented fuel deliveries, this proved an inefficient means of transport. The C-47 and C-54 did not exist in sufficient quantities at the start of the War, and their usable payload for fuel required multiple round-trips that burned as much fuel as these aircraft transported. Ground transportation of fuel faired no better. For every four gallons of fuel transported by ground, the vehicles consumed three.[28]

2.4 A Land Route to Supply the Air Route

By the late 1930s, the United States began fortifying Alaska; it reached a fever pitch after the Japanese attack on Pearl Harbor. Almost immediately, aircraft began flying north up the route. Fuel-hungry P-40s and B-26s made up the initial movement of aircraft to supplement the Air Force of the Alaska Defense Command.[29] The Northwest Staging Route would not hit full stride until the Soviets agreed to use the Alaska-Siberia (ALSIB) route between the United States and the Soviet Union as the primary means of aircraft movement approved by the Lend-Lease Act. Planners had to devise a new means of supplying fuel to support the 7,926 aircraft passing through on their way to the Eastern Front.

By September 1941, the Northwest Staging Route began to receive aircraft in limited numbers. Still viewed as a low priority, a small number of outdated aircraft began to move up the route to Alaska. Fort Nelson and Watson Lake in Canada lacked any overland road for support,

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[27] *The Canol Project*, 41.
[28] Raoul Drapeau, "Pipe Dream," *Invention and Technology*, 2002, 2.
[29] Smith., 41

relying entirely on aircraft to supply aviation fuel and gasoline for vehicles.[30] To support the movement of aviation-grade fuel, the United States had to rely on contracted fuel deliveries to supplement its ability to resupply these far-flung locations. As 1941 closed, winter had set in around the airfields, further slowing deliveries.

Even though the first Soviet Union-bound flights did not happen until September 1942, and the Japanese had not yet invaded the Aleutian Islands, military planners had already begun preparations for a land route connecting the airfields north of Edmonton to Fairbanks. Early on, logistical issues plagued the Northwest Staging Route. The highway would serve as a means to supply these distant fields and provide a means by which airmen could navigate and land in the event of an in-flight emergency. Planners did not intend for the highway to be a primary means of supply to the defense of Alaska.[31] Construction of the highway taught the Americans much about construction projects in the North; it did little to support Alaska's defense during the war.

Before World War II, governmental organizations and civilians alike discussed the idea of a route to Alaska; the idea received little serious attention. Donald McDonald, an engineer from Alaska, became the first serious booster for a land route to Alaska. In 1928, MacDonald envisioned a road from the United States through Canada to Alaska and the Soviet Union, connecting the three countries.[32] Unsurprisingly, the United States and the Soviet Union did not support this idea. Japan also objected to a highway to Alaska for fear of a build-up of military forces that could influence its operations in China and the North Pacific. The Japanese saw this as a further attempt by Western powers to encircle their country and curb its empire.[33]

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[30] Potter, 83.
[31] Harley Kilgore, "Investigation of the National Defense Program: The Canol Project," Investigation of the National Defense Program: The Canol Project § (1944), pp. 1-12, 8.
[32] Potter, 78.
[33] "A Concrete Blow at Tokyo," *The Saturday Evening Post*, November 7, 1941, 106.

On February 16, 1942, the Secretary of War, Henry Stimson, sent a declaration of military necessity concerning the construction of the Alaska Highway to the Secretary of State. Possible routes for the highway existed, including MacDonald's Route A, which followed the modern-day Cassiar Highway and would connect Prince George, British Columbia, Canada. to Whitehorse.[34] Route B proposed a direct line between Prince George, B.C., and Watson Lake. Route C, the least direct route of the three, connected the airfields along the Northwest Staging Route. The PJBD, not concerned with speed or directness, selected Route C.[35]

In April 1942, seven engineer regiments began bulldozing a 1500-mile route to Fairbanks out of the Canadian wilderness.[36] In June of that year, the Japanese launched a surprise attack against the military installations at Dutch Harbor in the Aleutian Islands. The Japanese followed by invading and capturing the Attu and Kiska, part of the Aleutian Island chain. The invasion gave renewed effort to the engineers working at breakneck speed to finish the Alaska Highway. By November 20, 1942, officials declared the highway complete. In reality, the route would only handle emergency traffic and frequently closed due to washouts and other seasonal issues. It would take another year and fourteen thousand workers to turn the highway into a reliable route to Alaska.[37] By then, Japan had retreated from Alaska and no longer posed a threat in the North Pacific.

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[34] Fern Chandonnet, *Alaska at War 1941-1945: the Forgotten War Remembered* (Fairbanks, AK: University of Alaska Press, 2008), 173.
[35] Potter.,85.
[36] Chandonnet. 167.
[37] Ibid., 167.

Figure 2. Mile 160 Alcan. Weir, Albert. Mile 160 Alcan. Photograph. Anchorage, 1942. University of Alaska Anchorage

A side task for those constructing the Alaska Highway included preparing emergency runways along the route for aircraft making their way north. Flying the staging route could be perilous; aircraft routinely crashed on the trip to Fairbanks. The highway offered pilots peace of mind when traversing the open expanses of wilderness between airfields and made the trip more survivable in an emergency. Until the Canol pipeline system became operational, the highway served as a means to move fuel and supplies between the fields. A point made clear in a letter from the Under Secretary of War dated January 14, 1943, the construction of the highway primarily served to resupply the airfields of the NWSR. He further went on to say that Canol construction would serve the fuel needs of the airfields.[38]

[38] *The Canol Project*, 102.

2.5 The Canol Pipeline Project

While construction on the highway began, it did little to fix the fuel situation along the staging route. Oilfields in the Midwest sent crude oil to California refineries for shipment north, stressing a fragile support network between Alaska and the Lower 48. If the Japanese cut the ocean routes in the Pacific, it would sever the main supply route to Alaska. The War Department had known for some time about the possibility of oil at Norman Wells. Arctic explorer Dr. Stefansson approached the department about the possibility of connecting to the oilfield via the Great Slave Lake and Mackenzie River, but the War Department did not act on it. [39] Exploiting this possible oil field would serve as an emergency oil supply and provide a continuous supply of petroleum products for the staging route.

Having done little to no investigative work to determine the feasibility of the oil fields at Norman Wells, the United States Army entered the oil business. General Somervell, the Army Service Forces commander, issued a directive in April 1942 to begin construction on the Canol Pipeline Project. Initially, the project consisted of prospecting for oil in the vicinity of Norman Wells and pumping crude oil to Whitehorse for refining into aviation-grade fuel and other fuels for ground vehicles. The project called for the construction of a 577-mile pipeline across the MacKenzie Mountains. The pipeline needed a mix of four and six-inch piping with the requirement to move 3,000 barrels of crude oil a day, which came to be known as Canol 1.[40] General Somervell mandated a completion date of October 1, 1942, a date he knew at the time would be impossible to meet.[41]

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[39] Kilgore, 2.
[40] *The Canol Project*, 2.
[41] Kilgore, 2.

To accomplish this, the War Department contracted with Imperial Oil, a subsidiary of Standard Oil, to explore the Norman Wells oil fields and expand its operations to support this new venture. The War Department contracted Bechtel-Price-Callahan to construct the pipeline and refineries. It also hired Standard Oil of California as consultants on the project.[42] Soon thousands of workers and troops descended upon Edmonton to start their trek north to Norman Wells. To reach the oil fields, workers had to ride by rail, boat, and barge across lakes and up rivers to get to the remote worksite. While construction ramped up, progress continued on the Alaska Highway, fuel still rolled by rail over White Pass, and pilots flew it into Fort Nelson and Watson lake.

Figure 3. Pipe laying and tacking at Mile 95, photograph (Ottowa, n.d.), National Archives Canada, Accession Number 1987-154, Box Number A0109

[42] Stan Cohen, *ALCAN and CANOL: a Pictorial History of Two Great World War II Construction Projects* (Missoula, MT: Pictorial Histories Pub. Co., 1998), 217.

Within weeks of Canol's beginning, the Japanese launched a surprise attack on Dutch Harbor. For General Somervell, this provided much-needed cover as a military necessity for a project that had started gaining criticism. Plagued by transportation delays and rough terrain, the completion date slipped further into 1943. Now that the Japanese occupied Alaskan soil, the Chief of Engineers on the project recommended constructing a second pipeline, Canol 2. The new project would improve how fuel moved via the Inside Passage. It called for the construction of tank facilities in Prince Rupert, B.C., and barges to carry fuel to Skagway. From Skagway, construction of a four-inch pipe and pump stations would move aviation fuel and gasoline to Whitehorse following the right of way along the side of the narrow-gauge railroad over White Pass.[43] By August 1942, construction on Canol 2 began, and by December of the same year, Whitehorse received its first gallon of 100-octane aviation fuel.

The completion of Canol 2 in late 1942 coincided with the start of aircraft moving north up the staging route. The fuel provided by Canol 2 powered the aircraft moving up the route to Ladd Field in Fairbanks. Most of the aircraft that passed through Ladd Field went on to fight against the Germans on the Eastern Front.[44] The summer of 1943 saw the approval of Canol 3 and 4, which connected Whitehorse to Watson Lake and Fairbanks, respectively. These lines could not have come at a better time for the staging route. The route supported 2,456 aircraft in 1943 and increased the following year.[45] By late July 1943, the first petroleum products arrived via Canol 3 to Watson Lake, the pipeline's southern terminal.[46]

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[43] *The Canol Project,* 68.
[44] Richard Finnie, "The Epic of Canol," *Canadian Geographic* 34, no. 3 (March 1947), 136.
[45] Chandonnet, 332.
[46] *The Canol Project*, 97.

2.6 Canol Falters

While Canol pipelines 2, 3, and 4 made progress and started to yield results moving aviation fuel along the Alaska Highway, Canol 1 fell further behind. Construction of the Canol Road proved difficult, crossing the Mackenzie Mountains, which separated Norman Wells from Whitehorse. Permafrost proved to be a formidable opponent slowing progress. As road construction continued, pipeline construction followed, laid directly on the road surface with no insulation.[47] By New Year's Day 1944, construction crews completed the road, and by mid-February, welders completed the last weld on the pipeline connecting Norman Wells to Whitehorse. The first barrel of oil reached Whitehorse for refinement by April 16, 1944, at the cost of $133,000,000.[48] The pipeline missed its completion date by a year and a half.

The Canol 1 pipeline moved crude oil for 319 days and had more than one hundred leaks. A storage unit along the Mackenzie River released approximately 35,000 barrels of oil before workers stopped the leak.[49] These problems severely shortened the lifespan of the Canol 1 pipeline. In fairness, construction equipment accounted for ninety percent of the damage and leaks to the line.[50] The birth of Canol came from military necessity and continued when the Japanese invaded the Aleutian Islands. The completion of Canol 1 came long after the threat of invasion ceased. By this time, barges filled with fuel utilized Canol 2 to move fuel to Whitehorse. Trucks and later pipelines transported the fuel up and down the highway to the airfields.

[47] D.E. Garfield, F.D. Haynes, H.T. Ueda, *The Canol Pipeline Project: a Historical Review* (Hanover, NH: Cold Regions Research and Engineering Laboratory, 1977), 11.
[48] Ibid., 14.
[49] Drapeau, 8.
[50] Garfield, Haynes, Ueda. 21.

Canol 1, as a means of providing fuel to the Alaska Highway, proved to be a failure. Whitehorse's refinery produced aviation-grade fuels between October 1944 and February 1945, totaling 23,459 barrels.[51] Fuel estimates for aviation operations along the Northwest Staging Route and Fairbanks for 1944 and 1945 exceeded 395,000 barrels.[52] During a Senate investigation on the pipeline project in 1944, the investigating committee determined that a single fuel tanker ship making one trip could carry as much 100-octane aviation fuel to Skagway as the entire Canol project produced by January 1, 1945.[53] The refinement of Canadian crude oil never lived up to the money spent on the project. It costs Canol at its cheapest $6.27 to produce a barrel of oil.[54] In contrast, crude oil in the United States cost $1.22 in 1945.[55]

Canol 2, 3, and 4 proved to be more successful. Aviation-grade fuels began flowing over White Pass from barges at Skagway to Whitehorse. Canol 3 moved fuel to Watson Lake, while Canol 4 connected to Fairbanks. The Truman Committee, fuming over the inflated cost of the additional pipelines, understood the necessity of the $35 million price tag.[56] When aviation-grade fuel from Norman Wells started flowing through the pipeline system, it would need to operate continuously for five years to produce the projected 931,000 barrels required for aviation operations along the route.[57] A few turns of a fuel transport tanker to waiting storage facilities would have accomplished what Canol 1 attempted to do at a fraction of the cost.

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[51] Ibid., 16.
[52] *The Canol Project*, 116.
[53] Kilgore, 22.
[54] Garfield, Haynes, Ueda, 16.
[55] "U.S. Crude Oil First Purchase Price (Dollars per Barrel)," U.S. Crude Oil First Purchase Price (Dollars per Barrel), accessed April 15, 2021, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=F000000__3&f=A.
[56] Drapeau, 10.
[57] Kilgore, 19.

Figure 4. Lend-Lease Aircraft at Ladd Field. National Museum of the United States Air Force, January 16, 2008.

2.7 Conclusion

Historians have never questioned the success of the Northwest Staging Route. Approximately 8,000 aircraft moved along the route to the Soviet Union. These aircraft provided the Soviets with much-needed time to move aircraft production facilities, deter Luftwaffe attacks, and help turn the tide in numerous battles. Supplemented by Soviet aircraft production, Lend-Lease aircraft helped gain air superiority and bleed the Luftwaffe of aircraft, pilots, and resources.[58] Aviation infrastructure along the route is still in use today.

After less than a year in operation, crude oil stopped moving down Canol 1 to Whitehorse on March 13, 1945.[59] Roughly ten percent or 4.9 million gallons of the oil pumped from Norman

[58] Chandonnet, 318.
[59] Garfield, Haynes, Ueda, 24.

Wells through the line never made it to Whitehorse, lost to spills during construction and operations.[60] Canol 2, arguably the most successful of the lines, provided most of the fuel along the highway, and in 1958 the Canadian government took control of the line. Canol 3 shut down after the war, and Canol 4 continued to provide fuel to Fairbanks until the construction of the Haines-Fairbanks Pipeline.

The failure of Canol 1 should not overshadow the legacy that is left behind. As the first pipeline in the Arctic, it served as a proof of concept for follow-on projects. By 1956 the military constructed the Haines-Fairbanks Pipeline as a replacement for Canol. Based on the military's need for oil to Alaska's interior, pipeline engineers designed the pipeline to move 9600 barrels of jet fuel to military locations around Fairbanks.[61] The Cold War had reached Alaska and, with it, the jet age. High-performance, supersonic jets assigned to Alaska consumed fuel at exponentially higher rates than their piston-era predecessors. The fuel moved through the pipeline and also supported stop-over flights for military troop movements to other theaters of operation.

The construction of these early pipelines laid the groundwork for every pipeline that followed. Canol, and to a certain extent, the Alaska Highway proved that large-scale road construction and pipeline laying over and under muskeg and mountainous terrain in the Arctic could be accomplished.[62] The project also showed the feasibility of oil exploration operations in the Arctic, which the Navy drew upon in 1944 during its search for oil. By the time the Navy arrived at Point Barrow, aviation infrastructure in Alaska had the ability to support large-scale oil exploration operations in remote regions. The Army did not have that luxury when it began its mega-projects in 1942. The Navy depended on infrastructure created by the Army. In turn,

[60] Drapeau, 8.
[61] Garfield, Haynes, Ueda, 3.
[62] Ibid., 1.

infrastructure created by the Navy on the North Slope during its exploration for oil supported Cold War-era airlifts constructing the DEW Line. Civilian oil companies benefited from lessons learned and infrastructure when they began to explore the oil fields around Prudhoe Bay. The success of the Trans-Alaska Pipeline System rested directly on the shoulders of these previous projects, which utilized aviation extensively for support.

Chapter 3 Aviation for Oil in the North

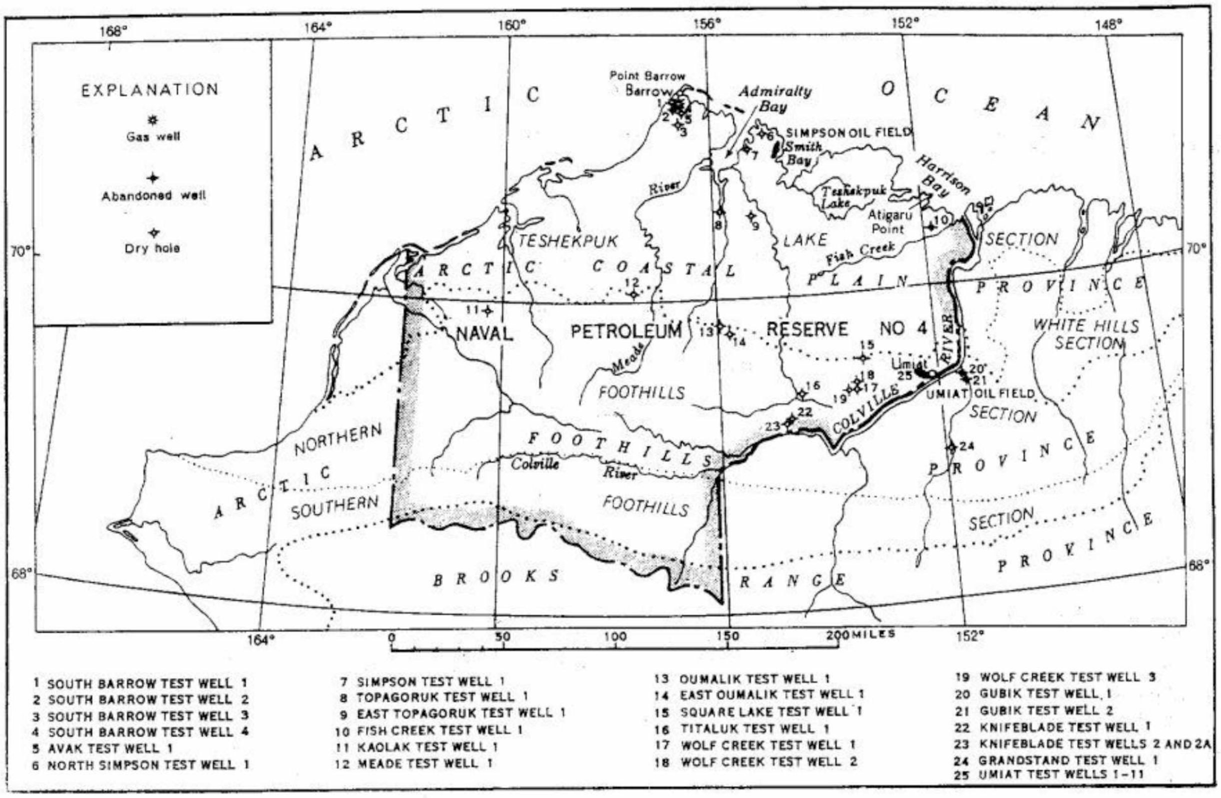

Figure 5. Naval Petroleum Reserve No. 4 Map. Florence Rucker Collins et al., *Test Wells, Umiat Area Alaska* (Washington DC: United States Government Printing Office, 1958), 72.

3.1 Introduction

In August 1944, Seabees of the U.S. Navy's Naval Construction Battalion Detachment 1058 sat aboard the *U.S.S. Spica* and the *SS Jonathan Harrington.* Initially trained to rebuild the oil fields in New Guinea, the unit consisted of experienced oilmen, geologists, and some veterans of the Aleutian Campaign. The men stared out through the fog at the desolate shoreline of Cape Simpson.[63] For days scouting parties went ashore to locate a suitable location while the ships navigated through heavy ice, waiting to download the remaining men and cargo. The scouting

[63] Bingham, 20.

parties had difficulty finding a good beachhead as the weather worsened and sailed towards Point Barrow. With the end of the Arctic summer fast approaching, men and cargo had to go ashore. Gale force winds and rough seas hammered the Seabees as they maneuvered their LCMs (landing craft, medium) through the ice as they worked towards the beach. Some landing craft damaged by ice limped ashore, leaving cargo in their wake. While the Allies in France fought it out hedgerow to hedgerow, a far more isolated group of servicemembers held a tenuous foothold on top of the world with winter fast approaching.

Prior to World War I, the United States Navy began a conversion of its fleet from a coal-burning navy to one that burned products refined from oil. To support the growing need for oil, the United States set aside four petroleum reserves for the U.S. Navy: two in California, one in Wyoming, and one in Alaska, the Naval Petroleum Reserve Number 4 on Alaska's North Slope. Commonly referred to as Pet 4, the Navy paid little attention to it until World War II. The Navy sent Lieutenant William Foran, a reserve officer, and tasked him with finding commercial quantities of oil in the Reserve. Decades earlier, William Foran had made the initial oil discoveries in the region.[64]

Aviation and oil exploration in the North were closely interconnected. Aviation had become a resource-intensive means of transportation, and northern Alaska had little infrastructure to support exploration and depended heavily on aviation for support. Oil exploration spurred infrastructure development across the North, culminating in the oil discovery at Prudhoe Bay. This chapter shows how aviation facilitated the development of the oil sector in two main ways, the reliance on aviation for day-to-day operations within the Reserve and the

[64] Reed, *Exploration of Naval Petroleum Reserve No. 4 and Adjacent Areas Northern Alaska 1944-53*, 3.

freedom of movement aviation provided to the Navy and contractors. Aviation became the only year-round mode of transportation within the Reserve. The flexibility afforded by aircraft that could change between wheels, skis, and floats allowed field teams to reach the furthest areas of the Reserve in a matter of hours instead of days or weeks. This chapter will also demonstrate how aviation expanded the reach of these field parties and became a more efficient way of collecting data over ground-based crews. Aviation enhanced the efficiency of exploration operations and sustained those in the field through supply movements, airdrops, and supply caches, which reduced the equipment load for those moving over land. This chapter demonstrates the use of aviation that enabled the Navy's initial breakout from Barrow into the Reserve.

In 1944 when the Navy began its exploration of Pet 4, the Army conducted oil exploration and pipeline construction projects in Northwest Canada and the interior of Alaska. The previous chapter demonstrated the feasibility of an Arctic pipeline. The Navy discovered over seventy-million barrels of oil at the Umiat oil field and created an infrastructure for future private exploration. The Navy also developed the techniques used in the first widespread use of aviation for oil exploration in the North. Private oil exploration benefited from the techniques first used by the Navy and its aircraft. Airfields at Barrow, Umiat, and Bettles became essential for aircraft moving equipment and personnel north. Put together, the accomplishments of the Army and Navy during World War II and the early days of the Cold War set the stage for the exploration to come.

3.2 The Oil Standard

The first in a line of many decisions that put the Construction Battalion Detachment 1058 on the North Slope searching for oil occurred before World War I. The United States began to explore the conversion of the Navy from coal-burning engines to ones that burned oil. Oil had many benefits over coal and steam. It allowed ships to reach higher speeds and refuel at sea, all of which provided an increased tactical advantage. To alleviate oil supply concerns before the full-scale conversion, President Taft set aside the first two Naval Petroleum Reserves in Elk Hills and Buena Vista, California.[65] Secure in the knowledge that adequate petroleum supplies would exist, Secretary of the Navy Josephus Daniels decided in 1913 that the future of the fleet would be one that burned oil.

World War I demonstrated the speed at which the oil age had arrived and the immense quantities needed to supply petroleum-hungry militaries worldwide. Needing to secure more petroleum for the Navy, President Wilson set aside land around Teapot Dome, Wyoming, as the third National Petroleum Reserve. To further meet the growing need for oil and to set aside potential oil reserves, President Harding set aside 37,000 square miles north of the Brooks Range in 1923 and established the Naval Petroleum Reserve Number 4.[66] The Reserve received little attention from the Navy until 1944, when the Navy needed new petroleum sources. It would take another world war with bigger ships and faster, more modern aircraft to spur the Navy into action on Pet 4.

Between 1944 and 1953, the Navy drilled thirty-six test wells and conducted geologic and seismic surveys. The Navy determined that Pet 4 held seventy million barrels of recoverable oil.[67] From the start of the exploration, aviation played a pivotal role in the operation's success. Navy PBYs, a twin-engine amphibious aircraft, and reconnaissance planes helped scout ice floes

[65] John A. DeNovo, "Petroleum and the United States Navy before World War I," *The Mississippi Valley Historical Review* 41, no. 4 (1955): p. 641, 647.
[66] "The Petroleum Industry in Alaska," *Alaska Monthly Review of Business and Economic Conditions*, August 1964, 2.
[67] Reed, 170.

during the initial beach landings, and these operations continued until 1953.[68] Aircraft such as the sturdy C-54 moved millions of pounds of personnel and equipment on line haul operations out of Fairbanks. Aircraft operating out of Umiat and Barrow moved smaller teams throughout the Reserve. Of the $47.6 million spent over the entirety of the exploration, almost 9% of that went to aviation.[69]

3.3 Naval Aviation's First Exploration in Alaska

Eighteen years before the Navy began oil exploration activities in Pet 4, they had launched its first aerial survey expedition in Alaska. George Otis Smith, the director of the Geological Survey, and Phillip Smith, the Chief Alaska Geologist, approached the Navy to help survey during the summer of 1926. The two bureaucrats decided on Southeast Alaska as the focus for the survey due to the proximity to waterways for the Navy and the economic potential for the timber and mining industries.[70] Unlike the Coast Guard and the Army, the Navy had the ships and aircraft necessary to operate in a wide range of environments and readily agreed to the venture. Economic value aside, the mapping expedition would furnish much-needed maps for the unsurveyed area.

By June 10, 1926, the Navy had its ships and aircraft in Ketchikan to begin the aerial survey work. The Navy had chosen the versatile OL-4 amphibious plane equipped with the T-1 tri-lens camera for this work, with one OL-2 aircraft equipped with a radio to sit in Reserve.[71] During its four-month deployment to Alaska, the expedition moved between Ketchikan,

[68] The aircraft is commonly referred to as the PBY short for Patrol Bomber, the Y is the manufacturers code for the Consolidated Aircraft Company who built the aircraft.
[69] Reed, 173.
[70] Rufus Harvey Sargent and Fred H. Moffit, *Aerial Photographic Surveys in Southeastern Alaska* (Washington, DC: U.S. Govt. Print. Off., 1929), 145.
[71] Robert W. Stevens, *Alaskan Aviation History* (Des Moines, WA: Polynyas Press, 1990), 323.

Wrangell, Petersburg, and Juneau. As the end of the summer neared and slowed down by bad weather and long shadows, the Alaskan Aerial Survey Expedition halted operations. The Navy had mapped 12,000 to 13,000 square miles while flying more than 300 accident-free hours.[72] The expedition accomplished a considerable feat, given the reliability of early aircraft and the adverse weather patterns of the region.

Three years later, in the late spring of 1929, the Navy returned to Southeast Alaska with improved aircraft and cameras to pick up where the previous expedition had left off. The Alaska Aerial Survey Detachment flew four OL-8 amphibious aircraft, two of which carried the T-2 four-lens camera, and one aircraft carried the K-3A camera for oblique photographs. The fourth aircraft served as a standby.[73] The Detachment began photo mapping operations on May 25, 1929, photographing most of Tongass National Forest, Baranof Island, and sections of the international border with Canada and numerous other islands and features. In total, the Navy photographed approximately 13,000 square miles of Alaska.[74]

Much like the survey conducted in 1926, weather significantly hampered the Navy's ability to fly. The Navy spent 104 days in Alaska, of which the Detachment had 18 good weather days for photographing.[75] Numerous times during the survey, the aircraft had to be moved ashore or placed on nearby docks utilizing their landing gear to find shelter from passing storms. As the summer wore on, the amount of usable daylight and the presence of longer shadows further

[72] Frederick Hale, *Award of the Distinguished-Flying Cross to Members of the Alaskan Aerial Survey Expedition.* (Washington, DC: U.S. Govt. Print. Off., 1930), 2.
[73] Arthur William Radford, *Report of the Alaskan Aerial Survey Detachment, 1929* (Washington, DC: United States Navy, 1929), B-8.
[74] Andrew R. Boone, "Rediscovering Alaska From the Air," *Current History (1916-1940)* 32, no. 1 (April 1930), 108.
[75] Radford, G-2.

limited the pilot's ability to photograph terrain. Despite these limitations, the Detachment took over 25,000 photographs during their survey.[76]

The information gathered during the 1926 survey benefitted the Geological Survey and Alaska's territorial leadership. The survey galvanized the relationship between aviation and industries such as mining, forestry, and fishing that would rely heavily on aviation in the future.[77] The expedition photos from 1929, and those taken during the 1926 expedition generated vast information that benefited multiple government agencies not associated with the survey. Photographs identified unreported lakes suitable for power generation, possible road routes, and valuable timber information for the Forest Service. Both expeditions demonstrated the potential that existed between aviation, scientific research, and the ability of the Navy to conduct operations in Alaska.

3.4 North to Alaska!

Before a full-scale exploration of Pet 4 could take place, a reconnaissance party led by Lieutenant William Foran set out to understand the current conditions in the Reserve.[78] Foran, a reserve officer in the Navy and a civilian geologist with experience on the North Slope dating back to the 1920s, understood the region and the potential for oil that existed. While unscheduled flights to Barrow from Fairbanks happened often, little infrastructure existed in the Reserve to support large-scale exploration activities. Foran and his reconnaissance party relied on bush pilots like Sig Wien to ferry them to Barrow from Fairbanks and during their time in Pet 4.[79]

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[76] Radford, J-5.
[77] Colleen Mondor, "1926 Aerial Survey of Southeast Alaska Improbable," *Alaska Dispatch News*, August 1, 2014.
[78] Ross Nixon, "The First Oil Wells in the Alaska Arctic," *Alaska Business Monthly* 34, no. 11 (November 2018): pp. 90,92-96, 90.
[79] Reed, 22.

The Navy did not go to Alaska blindly. The reconnaissance work and experience of Foran helped guide the Navy on where to start its exploration. Before Foran, the U.S. Geological Survey, at the direction and expense of the Navy, sent eight expeditions to the Reserve between 1923 and 1925. As its primary underlining purpose, the expeditions went to investigate the possibilities of obtaining commercial quantities of oil in the region.[80] To better understand the oil situation, the Alaska Territorial Department of Mines, along with the U.S. Bureau of Mines and Army Corps of Engineers, sent a team in the summer of 1943. Oil activity at Norman Wells in Canada and the talk of Alaska becoming a hub for trans-polar air transportation revived civil interest in Alaskan oil exploration.[81]

While the Allies clawed their way through France, the Seabees clung to the beach and fortified their position in Alaska as winter approached in the late summer of 1944. During the construction of the main camp, the Seabees began work on a 5,000-foot airstrip that soon became their lifeline to the outside world.[82] Ice floes had already made beach landings treacherous; soon, ships would no longer be able to support the Detachment. Aviation support became the lifeline between Barrow and the rest of the world. With the runway completed by the end of September, 162 flights arrived, bringing vital supplies and freight by the end of 1944.[83]

Before any exploration occurred, the Navy had to ensure it established its camp and constructed an airfield. From here, support for all other exploration-related activities occurred. In decades past, pilots used beaches, lagoons, and snow-covered areas as runways to land their small bush planes. The construction of a runway north of the village turned Barrow into a

[80] Norman Ebbley and Henry R Joesting, "Report of Investigations of Petroleum Seepages Arctic Slope Area Alaska," Report of Investigations of Petroleum Seepages Arctic Slope Area Alaska § (1943), 2.
[81] Ibid., 3.
[82] Nixon, 92.
[83] Reed, 28.

logistics hub on the North Slope. No other location north of the Brooks Range had a year-round runway. A compact, and by the summer of 1945, Marston mat surfaced runway made of interlocking 12.5 square foot Swiss cheese-stamped steel plates became the jumping point for the Reserve. The matting could handle aircraft up to 60,000 pounds allowing the larger four-engined C-54s to land at Barrow.[84]

Figure 6. Navy runway at Barrow. Berriochoa, 2022.

[84] Richard Smith, "Marston Mat," Air & Space Forces Magazine, accessed January 12, 2023, https://www.airandspaceforces.com/article/0489marston/.

3.5 Cat Trains, Umiat, and a Pipeline

With the camp and airfield established at Barrow, the Navy turned its attention south to the Reserve. From the initial reconnaissance, the Navy directed its efforts towards the Umiat anticline, a geological formation along the Colville River some 170 miles to the southeast. With no infrastructure to receive personnel and materials, tractor trains called cat trains moved hundreds of tons of material across the tundra. Crews completed shakedown runs delivering supplies between Barrow and Cape Simpson to develop techniques before the major push occurred to Umiat. Supported by aircraft to mark the way, cat trains departed Barrow in February 1945.[85] Cat trains became the preferred winter freighting mode of transportation to move large or bulky equipment that could not fit into an aircraft.

The cat train consisted of freight cars on skis pulled by bulldozers or tractors. The Navy did not invent this form of transportation; they adapted it to meet its requirements. Miners had been using this form of transportation in the interior of Alaska to move mining supplies and equipment to mines before spring break-up.[86] Teams made roundtrips From Umiat to Barrow and back in twenty-two days, supported by cached supplies and route markers dropped by aircraft.[87] The first train to Umiat contained equipment for constructing an airfield and camp. That winter, crews graded out an ice runway, and immediately Navy R4Ds, the Navy variant of the legendary DC-3, began delivering supplies to the site. By May, airplanes ferried in 1.4 million pounds of equipment, making life and exploration possible.[88] The R4D made the trip to Umiat in less than an hour compared to the six to seven days it took a cat train.

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[85] Reed, 36.
[86] "Antimony Mine Has Good Year," *The Alaska Miner*, November 22, 1938, 8.
[87] Hanson W. Baldwin, "At Point Barrow, Alaska's Northern Tip, the Navy Probes a Potential Oil Reserve," *New York Times*, June 12, 1949.
[88] Reed, 47.

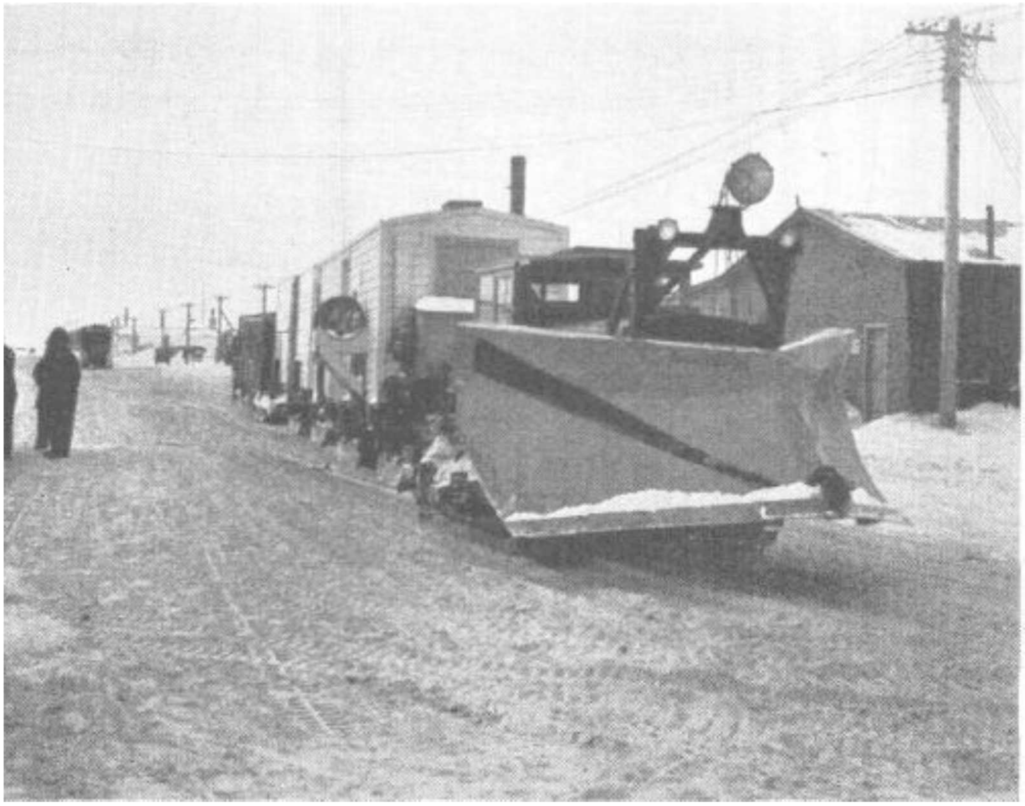

Figure 7. Tractor train at Barrow. John C. Reed, *Exploration of Naval Petroleum Reserve No. 4 and Adjacent Areas Northern Alaska, 1944-53* (Washington DC: United States Government Printing Office, 1958), 68.

Once Umiat had an operational year-round runway, the Civil Aeronautics Administration (CAA) began constructing radio and navigation installations to improve the facility. As a result, Umiat became one of the principal airfields on the North Slope. It became a routine stop for flights to and from Fairbanks and provided a logistics hub and jumping-off point for geological teams exploring the region. While winter freighting remained the preferred method of large equipment transportation, air freighting occurred routinely. The three main airfields north of the Brooks Range, Barrow, Umiat, and Barter Island, had runways that could support the larger four-engined C-54. From an economic standpoint, the Navy preferred using these aircraft to move large amounts of cargo to lower transportation costs.[89] After the end of the oil exploration, the Navy transferred control of the airfield to the Air Force, who immediately put it into use to support the construction of the DEW Line.

Umiat showed the most promise to supply the commercial quantities of oil the Navy hoped to find. Like the oil companies that discovered oil at Prudhoe Bay, the Navy decided to construct a pipeline if they discovered large enough quantities of oil. Not having the expertise organic to the Seabees, the Alaska Scouts provided teams to conduct a reconnaissance of the proposed pipeline route between Livengood and Umiat.[90] While the scouts and their dog teams broke trail, aircraft provided essential supplies along the route. In total, the scouts conducted reconnaissance over 600 miles under the worst conditions, supported by aircraft.[91] The route took the proposed pipeline south from Umait through Anatuvuk Pass and across the Koyukuk River en route to Livengood. The Trans-Alaska Pipeline partially follows the path scouted in the late winter and early spring of 1945.[92]

Present-day Bettles Field sits on the bank of the Koyukuk River midway between Fairbanks and Barrow. In 1945 the Navy selected this location, five miles upriver from the village of Bettles, as a location for an airstrip. Planners believed that the pipeline, once constructed, would pass through this location, so contractors for the Navy carved the strip from the forest to support the would-be pipeline. It also provided an intermediate landing location in the event of an emergency between Fairbanks and the Reserve. Alaska Natives in the area and those living in the village of Bettles began to migrate to the new airstrip as operations

[89] Ibid., 178.
[90] Bingham, 127.
[91] Fred Graham, "Seabees Drilling For Oil in Alaska," *The New York Times*, November 13, 1945.
[92] Nixon, 92.

increased.[93] The airfield became an air hub in the region serviced by Wien Alaska Airlines. The CAA soon installed weather reporting, traffic control, and navigation equipment to support flights into and out of Pet 4.[94] The settlement of Evansville sprang up on the perimeter of the strip forming the village known today.

3.6 Post-War Exploration

As World War II drew to a close, the Navy built three significant airfields to support the Reserve, Barrow, Umiat, and Bettles. Ladd Field in Fairbanks provided logistical support and line haul flights north. Other locations throughout Pet 4 relied on either cargo trains or small aircraft seasonally equipped for landing on ponds, gravel bars, or frozen lakes and snow. As the United States demobilized from war, the Seabee detachment deactivated on March 1, 1946, and contractors moved in.[95] Arctic Contractors and United Geophysical Company won the contracts to continue the exploration.

Aviation played a significant role in the summer exploration of 1946. Aircraft conducted 15,000 square miles of aerial geological reconnaissance, and five ground parties explored the southeast corner of the Reserve and further south.[96] Wien Alaska Airlines cached food, heating, and cooking fuel ahead of the parties. The parties used the M29 Weasel, a tracked vehicle, to move across the tundra. Aircraft conducted parachute drops of fuel ahead of the Weasels.[97] Caching freed up space for equipment and lightened the loads considerably on the slow-moving

[93] Donald J. Orth, *Dictionary of Alaska Place Names* (Washington, DC: U.S. G.P.O., 1971), 322.
[94] Kraus, 51.
[95] Bingham, 4.
[96] Reed, 56.
[97] William B Brosge and Charles L Whittington, *Geology of the Umiat-Maybe Creek Region Alaska* (Washington, DC: U.S. G.P.O., 1966), 505.

vehicles. In the coming years, aviation use for remote resupply and caching allowed Arctic Contractors to support more teams in the field.

Aviation became the workhorse, moving equipment and repositioning crews around the Reserve. As the only year-round mode of transportation, aviation shrank the tyranny of distance experienced by the exploration teams.[98] Aircraft, in support of contractors with the United Geophysical Company, began conducting airborne gravity surveys in July 1946.[99] While ground teams surveyed 2,552 stations across three locations covering 928 square miles, airborne sensors surveyed 252 stations and covered 1,466 square miles.[100] Aircrews conducted their survey in seventeen days and covered more terrain than the ground crews that surveyed for almost six months. Survey results from ground teams provided a much more detailed analysis than the researchers needed. As a result, airborne gravity surveys became the norm in the Reserve. Gravity surveys are not stand-alone reports; they are coupled with other surveys to generate information on possible petroleum deposits. The level of detail provided by quarter-mile ground survey stations provided more detail than required.[101] As the exploration progressed, the total distance surveyed from the ground decreased markedly.

As infrastructure at Barrow grew, more agencies outside the Navy began to take an interest in the Arctic. The Army, with its Beetle Projects, constructed three long-range radio navigation (LORAN) towers along the North Slope from the west of Barrow to Barter Island in the east. To support this, the Navy constructed a 5,500-foot runway, a camp, and air-sea rescue facilities. By the end of the Navy's search for Arctic oil, they supported twenty-four different

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[98] K. Marshall Fagin, "Exploration in Alaska," *The Petroleum Engineer (Reprint)*, September 1974.
[99] John R. Woolson, *Seismic and Gravity Surveys of Naval Petroleum Reserve No. 4 and Adjoining Areas, Alaska* (Washington, DC: U.S. G.P.O., 1962), 8.
[100] Ibid., 8.
[101] Woolson, 5

agencies using the Barrow facilities as a staging area.[102] The vast majority of the personnel for these outside agencies undoubtedly passed through the airport established by the Navy. The access aviation allowed enabled the widespread exploration and study of the Arctic.

Figure 8. Caching for a geologic team. John C. Reed, *Exploration of Naval Petroleum Reserve No. 4 and Adjacent Areas Northern Alaska, 1944-53* (Washington DC: United States Government Printing Office, 1958), 71.

Emerging across Alaska in the late 1940s, the helicopter started to gain the attention of surveyors. Helicopters began conducting survey work in Southeast Alaska and, by 1950, had

[102] Reed, 169.

arrived on the North Slope and became the preferred method of conducting gravity surveys. Able to land almost anywhere, helicopters became the ideal aircraft for conducting satisfactory gravity surveys, covering 7,000 square miles in three months of work with no accidents or forced landings.[103] A remarkable feat considering helicopter technology was in its infancy. Helicopters did not reach their full potential in the Arctic until the exploration of Prudhoe Bay in the late 1960s and the advent of the turbine engine.

Not all exploration happened within the boundaries of Pet 4. Numerous explorations happened east of Barrow and southeast of the Colville River that formed the southeastern boundary of the Reserve. Small bush planes became the preferred and sometimes only mode of transportation to and from these far-flung research sites. Aircraft out of Umiat supported research crews in the Killik-Itkillik region as they conducted geological surveys and generated geologic maps.[104] Like other field parties, bush planes cached supplies along routes the field parties intended to take during their exploration allowing the parties to move faster and lighter.

3.7 Exploration Slows to a Stop

By 1951, the Navy began considering the possibility of ending the exploration in the Reserve. With most of the Reserve explored, only the wells at Umiat showed any commercial or military prospects for oil. The Navy decided to reevaluate the future of the project mid-year. As a result, drilling operations took priority in an attempt to find oil over field team operations. Freighting increased throughout 1951, both on the ground and in the air. Aircraft carried 56,000 pounds of freight a week from Fairbanks to Barrow, and ground trains moved over 15,000 tons

[103] Woolson, 8.
[104] William W. Patton and Irvin L. Tailleur, *Geology of the Killik-Itkillik Region, Alaska* (Washington, DC: U.S. G.P.O., 1964), 411.

of freight and moved drilling rigs to new locations around the Reserve.[105] A total of nineteen different drilling locations drilled over 48,000 feet resulting in four wells believed capable of producing oil and four capable of producing gas in the Gubik and Umiat anticlines.[106]

By 1952 the Navy officially issued a stop order for 1953, ending the exploration of Pet 4. The Navy did not find the commercial quantities of oil it hoped for, and teams had explored all parts of the Reserve. The exploration of Pet 4 had not been in vain. The exploration yielded an immense amount of knowledge about the Arctic, logistics in the North, and the practical obstacles facing a project of this magnitude.[107] As the Navy pulled out, they transferred control of certain facilities, airfields, and equipment to the Air Force. Cold War defenses and the Polar Concept dominated Alaskan military spending and strategy. Soon a line of radars from the Aleutians to Greenland would dot the Arctic landscape, searching for Soviet bombers.

3.8 Aviation Accidents in the Reserve

Aviation around the Reserve became commonplace, with few accidents recorded during the exploration. However, each airline experienced accidents during its tenure on the contract. Wien lost a plane during landing in 1946 due to gusty winds. Alaska Airlines lost an aircraft and crew east of Barrow that could not be found. Transocean Airlines crashed attempting to land at Ladd Field in 1951.[108] The flight had originated at Barrow, and after a one-hour stop in Umiat, it departed for Ladd. The aircraft had a crew of two and six passengers when it crashed, killing all

[105] Reed, 138, 140.
[106] Ibid., 143.
[107] Peter A. Coates, *The Trans-Alaska Pipeline Controversy: Technology, Conservation, and the Frontier* (Fairbanks, AK: University of Alaska Press, 1993), 73.
[108] By 1950, Ladd Field was Ladd Air Force Base; however the CAB investigation refers to Ladd as Ladd Field.

on board.[109] Of those killed, two passengers worked for Wien Alaska Airlines, one a pilot, the other a mechanic.[110]

The aircraft crashed into Chena Dome, approximately 37 miles northeast of Ladd, attempting to intercept the final approach course. The pilot had become disoriented and reported their position 60 miles from where radar showed the aircraft. In the past, the flight captain had failed numerous instrument flight evaluations and displayed below-average ability in certain phases of instrument flying. [111] The captain did pass a flight and route check approximately two weeks before the accident. The CAB found the pilot had become disoriented while he made an unauthorized left turn that resulted in controlled flight into terrain.[112] It is astounding the number of flights in and around the Reserve operating in austere environments and unpredictable weather that accidents did not happen more often.

3.9 Conclusion

World War II and the Cold War created the demand for petroleum on scales that had yet to be seen, driving the Navy to explore Alaska's North Slope for nine years. The airplane became the pillar upon which the entire operation rested for the daily movement of supplies and people. BAREX convoys from southern ports arrived once a year, providing equipment too large for aircraft to carry. They did not run more than once due to the short sailing season in the North. No viable form of transportation existed to move freight and personnel quickly or in quantities sufficient to sustain operations. Without reliable aviation support, the Navy could not have conducted the exploration on the scale required to discover oil in the same amount of time.

[109] Civil Aeronautics Board "Accident Investigation Report, Transocean Airlines," (1952), pp. 1-10, 1.
[110] "Four on Plane Lost in Alaska," *The New York Times*, January 2, 1952.
[111] Ibid., 5, 6.
[112] Ibid., 7.

It is apparent that exploration leadership viewed aviation as a background activity; the details surrounding aviation activities in the Reserve are sparse. Reports detailed ground modes of transportation and movements in greater detail than their air movements. Aviation occurred in the background during an operation centered on discovering oil. This chapter has shown that aviation became an integral part of the exploration, making much of it possible. Perhaps post-war familiarity with aviation made it seem commonplace. Alternatively, unlike bulldozers or weasels, ordinary workers did not operate aircraft and grow attached to them the way they did ground vehicles. In the end, the Navy searched for oil; that is what most of the reporting reflects. As a result of the technological leap in aviation brought on by World War II, long-range air transport and flight through inclement weather became commonplace. The skill and reliability of backcountry and line haul pilots used by Wien, Alaska, and Transocean Airlines made complex flights routine.

Other large-scale military projects during the war and global events post-war overshadowed the Navy's work at Pet 4. The Northwest Staging Route and Lend-Lease, the Canol Pipeline Project, the Alaska Military Highway, and the Japanese invasion of the Aleutian Islands dominate Alaskan military history during the period. Post-war, the construction of the DEW Line, the Polar Concept, and the militarization of Alaska for national defense pushed petroleum exploration to the background. The infrastructure and techniques supported Cold War operations and the airlift required for DEW Line construction. It also set the stage for the eventual exploration of Prudhoe Bay, which used much of the same infrastructure.

Chapter 4 DEWing the Impossible

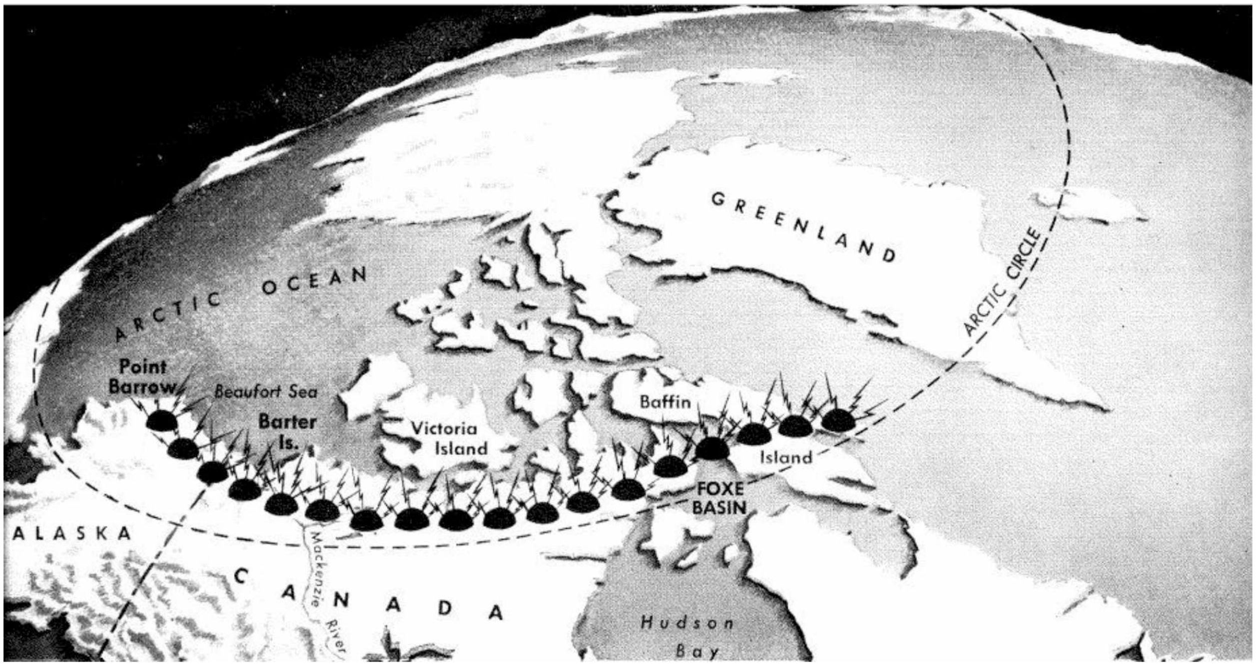

Figure 9. DEW Line radar stations. *The DEW Line Story* (New York, NY: Western Electric Company, 1958).

4.1 Introduction

A lone United States Air Force C-119, a twin-engine, twin-tail boom transport aircraft nicknamed the Flying Boxcar, droned toward an Arctic dropzone carrying a TD-8 bulldozer. A remote construction crew on the ground at the site of a DEW Line installation waited for the bulldozer to begin its work carving out an ice runway. On the pilot's signal, the crew in the back of the aircraft released the drogue chute, which pulled the palletized bulldozer into the sub-zero slipstream. When the main parachute deployed, the parachute cords promptly snapped in the frigid air, causing the bulldozer to plummet earthward, impacting the ground in spectacular fashion. The impact destroyed the bulldozer and scattered debris across the dropzone. The Air Force quickly arranged a second flight to drop in a new bulldozer. Inexperienced to extreme

Arctic conditions, crews encountered numerous problems like this during the DEW Line construction and had to learn on-the-fly ways to stay on schedule.

As military oil exploration operations drew to a close on the North Slope of Alaska, the threat of Soviet bombers became a top priority for military planners as the Cold War began. In August 1949, the Soviet Union detonated its first atomic bomb. This new nuclear capability, paired with the Tu-4, a copied version of the B-29 bomber, could reach targets deep into the United States on a one-way bombing mission. To provide early warning of possible Soviet air attacks, the United States and Canada constructed the Pinetree Line, a series of 39 radar stations arrayed along the 50th parallel in the early 1950s. Realizing this radar line could not provide early enough warning, American military leaders approached Canada about constructing two more lines of radar, the Mid-Canada Line along the 55th parallel and the DEW Line along the 70th. In theory, adding these two rows of radar provided redundant capability across the continent, providing reaction time for North American defenses.

Largescale construction projects before the creation of all-weather land routes in the North depended heavily on the flexibility of aviation. Aviation infrastructure developed by the US Navy in Pet 4 provided a ready-made hub for the Air Force construction of the DEW Line in Alaska. The continued infrastructure development along the North Slope ultimately provided civilian oil companies with existing infrastructure for their oil exploration and development of Prudhoe Bay. This chapter will demonstrate how year-round aviation enabled the Air Force and its contractors to take largely unproven technology and project North American military power to the most remote regions of the Arctic in a very short amount of time. Commercial air carriers, supported by the United States military, expanded upon and created new infrastructure in the North. New airfields and equipment improved the critical logistics network needed to construct and maintain remote outposts cut off from existing road networks and population centers further south.

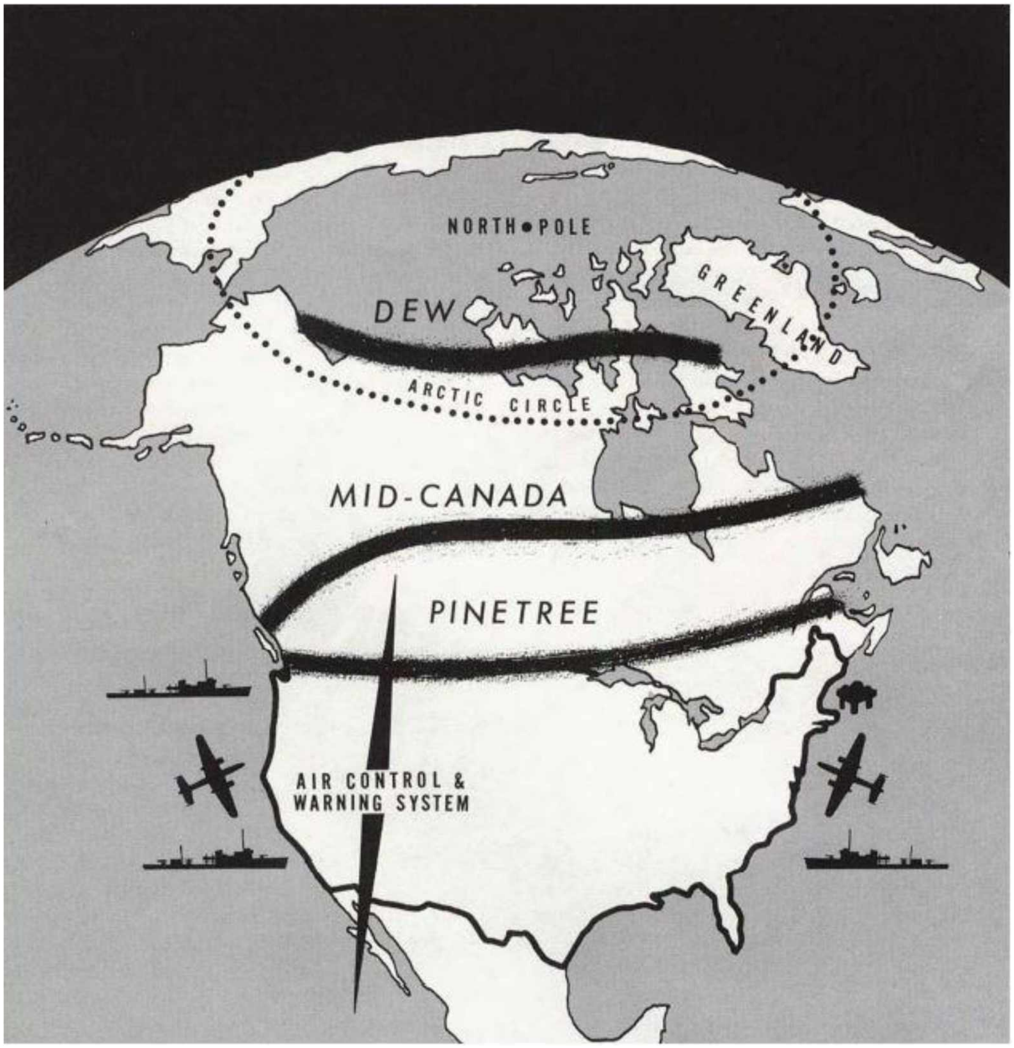

Figure 10. Radar defense lines. P. Whitney Lackenbauer and Alexander Herd, in *Calgary Papers in Military and Strategic Studies* (Calgary, AB, Canada: Centre for Military and Strategic Studies, 2008), 171.

4.2 Exposed Flank

As the Cold War escalated with the Soviet's detonation of its first atomic bomb, the American military focus on the Arctic increased. While active in the North during World War II, the US military conducted limited offensive operations and struggled against harsh environmental conditions. To defend against the possibility of over-the-pole Soviet attacks, the United States had to overcome the technological and engineering challenges such a defense required. General Carl A. Spaatz, the first Chief of Staff of the Air Force, understood the importance of the Arctic as a new theater of operations when he said, "Across the Arctic any industrial target is within the reach of our Air Force. The United States is similarly exposed."[113] Military planners assumed the Soviet Union viewed the Arctic in the same tactical way as the United States and would attack over the Pole on one-way bombing missions.

In 1952 the US Air Force called together twenty of the leading scientists and engineers in the United States and those with knowledge of air defense to convene at the Massachusetts Institute of Technology's Lincoln Laboratory to answer the question, "How can we best defend our country against attack?"[114] The group, known as the Summer Study Group, chaired by MIT's Jerrold R. Zacharias, a highly esteemed physicist, recommended a string of radar installations along the 70th parallel stretching from Barrow to Baffin Island.[115] To determine the feasibility of a line of radar stations spanning the Arctic, the Summer Study Group, along with the Air Force and Western Electric, the prime contractor for the DEW Line, began construction on an eighteen-site test line starting in July 1953 between Barrow and Barter Island near the Canadian border.[116]

The Air Force chose Point Barrow and Barter Island as the two primary testing locations, with smaller intermediate sites in between. In 1947, the Army, with help from the Navy already

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[113] Bernt Balchen, "Engineering Problems in the Arctic," *Society of American Military Engineers* 44, no. 302 (November 1952): pp. 426-428, 426.
[114] Morenus, 24.
[115] F. Robert Naka and William W. Ward, "Distant Early Warning Line Radars: The Quest for Automatic Signal Detection," *Lincoln Laboratory Journal* 12, no. 2 (2000): pp. 181-204, 181.
[116] Peter Grier, "A Line in the Ice," *Air & Space Forces Magazine*, February 1, 2004.

in the region exploring for oil in Pet 4, constructed LORAN sites as part of Project Beetle at locations west of Barrow and on Barter Island. As a result, Barter Island had infrastructure and, most importantly, an airstrip to support DEW Line test operations.[117] Likewise, Barrow provided an improved location for the Air Force to assume control of and use as a regional logistics and construction hub. By the summer of 1953, the Navy had concluded its exploration of the North Slope and began shutting down its operations and transitioning the base into caretaker status. In short order, the Navy began to transfer equipment and supplies to the Air Force and its contractors, who then forwarded supplies to Barter Island.[118]

By 1954 with a winter of testing conducted on equipment and the radar array, the Air Force felt comfortable moving forward with construction. President Eisenhower approved the plan, but the Canadians still had to approve it on their end. Three-quarters of the proposed locations sat on Canadian soil, and images of American mega-projects from World War II elicited apprehension from the host nation.[119] To address issues over sovereignty, Canada would select sites on a joint basis with the United States and would also retain ownership of the land. More importantly for Canada, the United States would incur the entire construction cost.[120] With Canada on board, construction began in the spring of 1955 with an ambitious completion date of July 31, 1957.

4.3 Aircraft to the Canadian North

As part of the agreement between the United States and Canada, the United States committed to using Canadian air carriers for all airlifts within Canada's western, central, and

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117 Reed, 81.
118 Ibid., 168.
119 Joseph T. Jockel, *No Boundaries Upstairs: Canada, the United States and the Origins of North American Air Defence 1945-1958* (Vancouver, BC: University of British Columbia Press, 1987), 83.
120 Ibid., 97.

eastern sectors. As a result, Canadian Pacific Airlines, created by the Canadian Pacific Railroad during World War II, Associated Airways Limited, and Maritime Central Airways, became the prime contractors overseeing seventeen operators for the main airlift.[121] The plan called for the three air carriers to begin movement immediately. However, with the immense quantities of cargo moving north, it took the Canadian aviation industry time to acquire aircraft of sufficient quality and quantity to start moving cargo. To help the early Canadian efforts, U.S. Air Force crews with their massive C-124 Globemasters and the C-119s stepped in and provided support moving cargo north before the spring thaw rendered ice runways unusable.[122]

In the late winter and early spring of 1955, the North sat on the eve of the largest commercial airlift ever attempted up to that point.[123] To set the conditions on the ground, small aircraft with survey crews and small construction teams arrived by bush plane. Once established, Air Force C-119 transports dropped bulldozers and other equipment necessary to grade out ice runways for the larger transport aircraft. Construction crews repeated this technique at each location across the DEW Line. After the spring thaw, these crews installed permanent runways that permitted year-round use. To ensure the cargo made it to its assigned locations before the May 15 cutoff, the estimated date that ice would no longer support a C-124, the Air Force agreed to provide 50 aircraft to move between 2,000 and 3,000 tons.[124]

In preparation, Canadian contractors began pulling from across Canada and the world for enough aircraft to start work. Contracted for the initial survey work, Spartan Airways purchased

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[121] Lackenbauer, Heidt, 114.
[122] *The Distant Early Warning (DEW) Line Coordinating Committee Minutes and Progress Reports, 1955-63* (Calgary, AB: University of Calgary, 2019), 32.
[123] *The DEW Line Story* (New York, NY: Western Electric Company, 1958), 19.
[124] Farish, 31.

and ferried small World War II surplus reconnaissance aircraft from England.[125] Maritime Central Airways and Associated Airways took possession of the large four-engined Avro York, a four-engined transport used heavily during the Berlin Airlift. To further augment the Canadian effort that required eighty-five aircraft and 425 pilots to move the cargo, officials subcontracted with carriers in the United States for forty additional aircraft.[126]

The Canadian air cargo industry experienced a dramatic leap in 1955 with the start of the airlift. Between March and November, aircraft moved over 17,000 tons of supplies north from staging locations such as Edmonton, Alberta. This drastic increase in activity came with a price.[127] In as many months, Associated Airways crashed six aircraft killing thirteen people during airlift flights for the DEW Line. Anxious not to miss out on the opportunity, Associated Airways flew overloaded aircraft, and the Department of Transport failed to enforce regulations properly. When pressed on the issue, the Minister of Transport George Marler downplayed the crashes and said, "The urgency of defense requirements made it necessary to undertake the airlift without delay."[128] The crashes and loss of life cost Associated Airways its contract on the DEW Line, and by the end of 1955, the air carrier no longer existed.

By 1956 the mad scramble for aircraft and pilots had stabilized, but tension grew between the Canadian Airline Pilots Association and the Air Industries and Transport Association (AITA). The Canadian Airline Pilots Association accused AITA and the government of rushing into DEW Line construction, flooding northern Canada with obsolete and inadequate aircraft, causing the United States to haul cargo rightfully theirs. They further accused AITA and the

[125] "Radar Airlift Contract Given To City Firm," *The Edmonton Journal*, February 14, 1955, 1.
[126] Moreuns45.
[127] Lackenbauer, Heidt, 100.
[128] "Mr. Marler and the DEW Line," *Lethbridge Herald*, January 11, 1956.

government of creating "the biggest collection of junk ever assembled on a Canadian airfield."[129] The Canadian Airline Pilots Association also contended that the Canadian government awarded contracts to inferior companies that, in turn, subcontracted to American carriers sending jobs and money out of the country.

Before World War II, Canada had no airlines of significance, almost no civil aviation infrastructure, and rudimentary aircraft manufacturing.[130] On the other side of the border, the United States led both Canada and England in infrastructure and competitive airlines. The Canadian aviation industry made great strides during WWII but still lacked the capacity of its neighbors to the south coming out of the war. Canada built 16,418 aircraft during WWII, a massive increase over the roughly forty produced annually in the pre-war years.[131] The United States had the advantage of large quantities of surplus transport aircraft after the war. An agreement with England left the production of transport aircraft to the United States.[132] Canada produced fighters, some bombers, and trainer aircraft under license from British companies leaving them without surplus cargo aircraft. The War Assets Corporation in Canada, the firm developed to divest Canada of its wartime equipment, did sell some aircraft for use as aircraft. However, most of the surplus Canadian aircraft had been rendered inoperable or immobile by cannibalization being more valuable for their parts than as functioning aircraft.[133]

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[129] Lackenbauer, Heidt, 100.
[130] Alan Dobson, "Canadian Civil Aviation 1935–45: Flying Between the United States and Great Britain," *The International History Review* 34, no. 4 (December 2012): pp. 655-677, https://doi.org/10.1080/07075332.2012.690190, 656.
[131] Canadian War Museum, "The War Economy and Controls: Aircraft Production," WarMuseum.ca - Democracy at War - Aircraft Production - Canada and the War, accessed January 16, 2023, https://www.warmuseum.ca/cwm/exhibitions/newspapers/canadawar/aircraft_e.html#:~:text=The%20War%20Economy%20and%20Controls%3A%20Aircraft%20Production&text=It%20delivered%2016
[132] Dobson, 657.
[133] Alex Souchen, *War Junk: Munitions Disposal and Postwar Reconstruction in Canada* (Vancouver ; Toronto: UBC Press, 2020), 189.

The DEW Line airlift in Canada ended with the completion of construction. Canadian air carriers still provided logistical support to site locations, but the intensity of the construction phase had ended. Canadian air carriers reaped the benefit of the massive influx of American money. They charged the exorbitant rate of 80 cents per ton-mile compared to 18 cents charged in the United States.[134] In the Central and Eastern sectors alone, over 21,000 tons of cargo moved north. Air carriers earned over $21 million as a result.[135] The airlift also pushed Canadian air carriers further north for more extended periods increasing capabilities in the region. Carriers consolidated, which set the stage for increased service after the airlift ended.

4.4 DEW Line Legacy

Unlike the World War II Alaska-Canada Highway mega-project that did not consider Canadian desires and existing routes, DEW Line resupply operations would. The Federal Electric Company, who took over the DEW Line contract post-construction, agreed to use air routing that coincided with Canadian desires.[136] Air carriers consolidated and grew from small bush plane operators into modern airline operators. After a disastrous first year in 1955 for Associated Airways, Pacific Western Airlines bought out the airline and went on to get awarded more contracts from the Air Force. Air Canada eventually bought out Pacific Western Airlines, becoming the largest airline in the country. Consolidation of air carriers in Canada stabilized northern routes, stopping the cutthroat practice of price cutting amongst carriers, creating better service.

Cities like Edmonton and Montreal benefited from the consolidation of air routes after the construction, becoming regional hubs. The realignment coincided with the wishes of

[134] Farish, 69.
[135] Ibid., 56.
[136] Lackenbauer, Heidt, 104.

Canadian air carriers and their regional priorities. The post-construction steady-state operation did not benefit all; small cities that grew to prominence, such as Mont Joli, Quebec, along the St. Lawrence River, lost a significant source of revenue when the airlift ended. The airport employed a large portion of the city. While understood by the Canadian government, it did little to help.[137]

The Canadian aviation industry attempted to modernize and keep pace with changes in aviation technology and needs. In the economic slump that followed World War II, De Havilland Aircraft of Canada emerged as the leading aircraft manufacturer. As aviation turned northward, De Havilland designed and built aircraft for the Canadian North, capable of operating from small unimproved airstrips. During the Cold War, the company also built trainer aircraft for the expanding Royal Canadian Air Force and sold aircraft to the United States military for use around the North and around the world. Avro Canada, the Canadian division of the British company, built its first jet fighter in the early 1950s and, by 1957, had designed and flown the supersonic CF-105 Arrow. The Cold War had brought the Canadian aviation industry on par with other Western aircraft manufacturers.

While the DEW Line moved from concept to reality, collecting the information provided by the new line or radars and coordinating continental air defense needed a headquarters for command and control. In the United States, each branch of the military had a part to play in intercepting enemy aircraft, each with its own command structure. Complicating matters, the United States manned radar stations and fighter squadrons in Canada controlled by the Royal

[137] Ibid., 105.

Canadian Air Force (RCAF).[138] Seeking a more formal structure to coordinate efforts required a political as well as a military solution. The two countries agreed to a combined command and created the North American Air Defense Command (NORAD), which came online as the DEW Line finished construction.

4.5 The Globemaster

The Douglas C-124 Globemaster first rolled off the assembly line in May 1950 as the Air Force's largest cargo aircraft. Capable of carrying tanks, field guns, or bulldozers, the Globemaster could carry over 68,000 pounds of cargo, double the capacity of the C-54s and DC-6s operating in Alaska. The Globemaster became the backbone of the Air Force's airlift capability during the construction of the DEW Line. The C-124 featured a clamshell door on the nose of the aircraft, which allowed the aircraft to fit prefabricated structures and provide a roll-on, roll-off capability for vehicles allowing faster turnaround times in the North. Perched atop a narrow wheelbase when viewed from the side, the C-124's bulky fuselage looked awkward with its narrow wings and four engines providing 3,800 horsepower each. These aircraft operated out of bases across the United States from South Carolina to Washington. The Air Force committed forty-four of these gigantic aircraft to the Canadian side of the project alone. A staggering number considering that the Air Force had just over 400 of these aircraft. During Operation Big Haul, the name for the springtime airlift in 1955, C-124s moved 6,600 tons of cargo north in Alaska and performed over 300 landings.[139]

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[138] Joseph C Scott, "Watching the Skies: The Founding of North American Air Defense Command," in *Stand up and Fight! the Creation of U.S. Security Organizations, 1942 - 2005* (Carlisle, PA: Strategic Studies Inst. and United States Army War College Press, 2015), pp. 189-202, 195.
[139] "'Operation Big Haul' Was First Phase in DEW Line," *Fairbanks Daily News Miner*, November 8, 1955.

Figure 11. C-124 Globemaster. *The DEW Line Story* (New York, NY: Western Electric Company, 1958).

The success of Operation Big Haul in the spring of 1955 depended heavily on the C-124. The aircraft augmented Canadian efforts and moved cargo freely in Alaska. The Air Force set a date of July 31, 1957, as the project's completion date. To meet that date, construction had to begin immediately before the arrival of equipment by sea and before the temperatures warmed, rendering ice runways unsafe. By June 1, the Air Force had completed 1,183 flights to DEW Line locations in both countries.[140]

4.6 DEW Line in Alaska

At the onset of construction for the DEW Line, Alaska benefited from government spending on infrastructure during World War II and immediately after. Fairbanks and Anchorage

[140] Thomas W Ray, *A History of the DEW Line 1946-1964* (Air Defense Command, 1965), 30.

became home to large Army and Air Force installations and two new modern airports. The Air Force moved from Ladd Field to a new location twenty-six miles southeast that became Eielson Air Force Base, which boasted the longest runway in North America.[141] In 1948 Congress approved funding to rehabilitate the Alaska Railroad, viewed by the Army as its primary all-season line of communication.[142] The Army rebuilt the ports in Seward and Valdez and the roads and rail lines connecting them. When the largest Arctic construction project ever attempted kicked off, Alaska's ports and rail lines could accommodate all sizes, types, and quantities of military freight.[143]

As opposed to Canada, the United States enjoyed the unincumbered ability to construct the Dew Line in Alaska with a mix of military and civilian assets. Military installations served as logistics hubs, and military cargo aircraft operated as necessary without the requirement to use civilian facilities. Still a territory, the federal government owned the majority of the land and did not have to seek approval in Alaska for construction to proceed. Leaders in Alaska had been lobbying for military spending in Alaska as the threat of possible Soviet aggression began to rise. In 1949, Territorial Governor Ernest Gruening castigated military leaders for their reluctance to increase the military's footprint in Alaska and lobbied for the creation of a radar screen across the North.[144]

The military and civilian contractors used and expanded upon the traditional transportation routes to Alaska. The military had at its disposal the largest cargo aircraft of its

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[141] John Haile Cloe and Michael F. Monaghan, *Top Cover for America: The Air Force in Alaska, 1920-1983* (Anchorage, AK: Anchorage Chapter-Air Force Association, 1987), 160.
[142] Lyman L. Woodman, *Duty Station Northwest. The U.S. Army in Alaska and Western Canada, 1867-1987: 1945-1987*, vol. III (Anchorage, AK: The Alaska Historical Society, 1999), 62.
[143] Laurel J. Hummel, "The U.S. Military as Geographical Agent: The Case of Cold War Alaska," *Geographical Review* 95, no. 1 (January 2005): pp. 47-72, 61.
[144] Jonathan M. Nielson, *Armed Forces on a Northern Frontier: The Military in Alaska's History, 1867-1987* (New York, NY: Greenwood Press, 1988), 185.

day and the national priority to exploit its capability. The C-124 doubled the carrying capacity of the largest World War II aircraft. These aircraft could land at existing airports in Barrow or Barter Island or go directly to landing strips adjacent to larger construction sites. From larger logistics hubs, World War II-era transport aircraft like the C-47 and C-46, already proven Arctic aircraft, moved equipment to smaller sites. The Alaska Railroad ran as far as Eielson Air Force Base, built outside of congressional funding by the Army Corps of Engineers.[145] Convoys of ships left Seattle during the summer for Barrow, and giant Sno-Freighters, the massive twenty-four-wheeled land train that blazed its own trail, carried up to 150 tons per trip overland during the winter.[146]

Unlike Canada, the United States invested in infrastructure along its northern frontier during World War II. The military concentrated most of its installations south of the Brooks Range along the coast and the Aleutian Islands. While not robust, the Barrow and Barter Island installations left over from Pet 4 provided anchoring points for DEW Line construction. Airstrips at Umiat and Bettles south of the Brooks provided additional staging and support. Newly acquired by the Air Force, Barrow became the main construction site for the DEW Line in the United States. In the early spring of 1955, the airlift from Fairbanks moved 8,000 tons of cargo to Barrow before being moved by cat train to proposed radar locations.[147] Learning from the Navy's experience in winter, contractors assembled large cat trains moving heavy equipment and buildings on skis.

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[145] Woodman, 63.
[146] Alex Oagana, "The Story of the Huge U.S. Army Land Trains," TopSpeed, May 20, 2021, https://www.topspeed.com/cars/guides/the-story-of-the-huge-u-s-army-land-trains/.
[147] V.B. Bagnall, "Building the Distant Early Warning Line," *Society of American Military Engineers* 47, no. 320 (1955): pp. 429-432, 430.

As in Canada, radar locations in Alaska had to be ready to receive cargo once the ice went out in the Arctic Ocean. Out of Seattle, the largest shipment in support of any one project since World War II departed the first summer of construction. The fleet moved approximately 50,000 tons of electronics material and other supplies to locations along the coast.[148] By 1955, the convoys moving north had at their disposal weather reconnaissance capabilities from the Air Force making routine flights north of Alaska, providing weather and ice information to the fleets. As they did for the Barrow Expedition ships supporting the Navy, small aircraft provided immediate ice reconnaissance for the ships maneuvering to unload cargo.

Naval convoys accounted for the majority of cargo moved during construction, moving 281,600 tons of cargo.[149] Aviation did not move the most tonnage, but aviation moved cargo more frequently and to more places. As cargo flowed into Barrow and Barter Island, it fell upon smaller civilian aircraft to move aircraft laterally along the line. Larger civilian air carriers like Interior Airways and Wien Alaska Airlines, accustomed to military contract flying on the North Slope, ran routine passenger and cargo service between Fairbanks and radar sites. Aviation along the line provided the only year-round transportation method and became the connective tissue between the logistics nodes. Construction of radar sites included runways, depending on the size of the installation determined the size of the runway. Main stations handled the C-124 and other large transports, while intermediate and auxiliary sites had smaller strips serviced by twin-engine aircraft and bush planes.

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[148] "More Than 20 Ships Loading For Journey to Arctic Coast," *Fairbanks Daily News-Miner*, June 10, 1955, pp. 1-12, 1.
[149] *The DEW Line Story* (New York, NY: Western Electric Company, 1958), 27.

4.7 Interior Airways

Interior Airways, an air carrier based in Fairbanks, rose to prominence during the DEW Line's construction phase and became the single largest owner of civilian C-130s during the build-out of Prudhoe Bay in the 1970s. James Magoffin believed the DEW Line contract played into his company's strengths and emerged from the construction of the test line solidly involved in a flying contract for the duration of the construction.[150] As the cargo flights increased, Interior Airways grew in size. Pulling from surplus stocks from around the country, Interior Airways increased its fleet with minimal delay.[151] Canada did not have the luxury of a surplus stock of World War II aircraft like those that carriers in Alaska could pull from. Canadians pulled from surplus aircraft in England with disastrous results.

James Magoffin, the owner of Interior Airways, grew the air carrier from small bush planes to large military surplus multi-engine aircraft during the DEW Line construction. The growth came with some pain as larger aircraft joined the fleet. Magoffin had to navigate the CAA and certification for approval to fly aircraft larger than 12,500 pounds. Emerging from bureaucratic delays and with appropriate operating certificates, Interior Airways continued to provide contract flights and non-scheduled charter operations. These contracts extended into DEW Line resupply operations once construction concluded and prime contractors changed hands. Interior Airways gained significant experience in Arctic flight operations that became instrumental for decades to come.

[150] James Magoffin, *Triumph Over Turbulence: Alaska's Luckiest Bush Pilot* (Sarasota, FL: Bookworld Services Inc, 1993), 109.
[151] Ibid., 121.

4.8 Helicopters Take Flight

The helicopter began to see increased usage during the construction of the DEW Line. Helicopter technology had improved from the early underpowered bubble canopy model Bell 47s that made their first appearance on the North Slope during the exploration of Pet 4. The Army first introduced the helicopter to the North during World War II at Ladd Army Airfield when the Sikorsky YR-4B arrived for cold weather testing in 1943. By 1955 helicopters had been successfully used in scientific survey work, cargo hauling, and passenger movements in Alaska. Helicopters also saw extensive use in Canada along the Mid-Canada Line and across the DEW Line.[152]

Both the United States and Canadian navies carried helicopters on board their ships while they moved freight to northern shores. The aircraft provided convoys with ice reconnaissance and ship-to-shore personnel movements. Helicopters extended the reach of the ships and moved cargo between ships and onshore. The HMCS *Labrador*, a Canadian icebreaker, used their Piasecki HUP-3 tandem-rotor helicopters extensively, supporting DEW Line construction. Pioneering shipboard helicopter operations for Canada, helicopters soon became essential components of modern icebreaking operations.[153] The United States Air Force delivered H-21 helicopters to Barrow and Barter Island to assist cargo movement to remote locations and, more importantly, to provide search and rescue. The H-21 quickly lived up to its nickname as the workhorse, with a useful load exceeding 6,000 pounds.[154]

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[152] Bob Petite, "Down the Line," Vertical Magazine, 2009, https://www.helicopterheritagecanada.com/ckfinder/connector?command=Proxy&lang=en&type=Files&currentFolder=%2F&hash=c245c263ce0eced480effe66bbede6b4d46c15ae&fileName=V14I5-Rewind.pdf, 2.
[153] Don MacNeil, *Rotary Wings over the Arctic: Diaries of HMCS Labrador's Flight Operations, 1955-1958* (Antigonish, NS, Canada: Mulroney Institute, St. Francis Xavier University, 2018), 3.
[154] Mark Albertson, "Boeing-Vertol CH-21 Shawnee (Flying Banana)," Army Aviation Magazine.com (Army Aviation Association of America), accessed October 30, 2022,

4.9 Conclusion

The airlift in support of the DEW Line construction lasted a frantic thirty-two months, becoming the most extensive commercial airlift in history. Some 45,000 flights occurred between the United States and Canada, utilizing eighty-one civilian air carriers in addition to the military.[155] As a result, aviation made the North more accessible by adding over forty new airfields, helicopter landing sites, and its associated navigational equipment.[156] While the military explored Alaska north of the Brooks Range during World War II, Canada's north remained relatively ignored until the Cold War. The United States used and expanded upon existing infrastructure that propelled research and exploration in the region.

The Cold War in the North put aviation at the intersection of technology, diplomacy, and security. The most noticeable difference between the two areas of construction, Alaska and Canada, is the rules by which the United States had to use. Having ceded certain aspects of its sovereignty to the United States in World War II, Canada did not make that same mistake twice. While still beholden to United States funding of the DEW Line, Canada forced the Americans to use its airfields, personnel, and companies to receive and move cargo to the radar sites. As a result, Canada stumbled in the spring of 1955. Canada did not have the surplus of aircraft to draw from to support the initial surge of cargo arriving at Edmonton, Yellowknife, and other northern hubs. Some Canadian air carriers subcontracted to American firms to operate under

http://www.armyaviationmagazine.com/index.php/history/not-so-current-2/714-boeing-vertol-ch-21-shawnee-flying-banana.

[155] *The DEW Line Story* (New York, NY: Western Electric Company, 1958), 26.

[156] Jonathan M. Nielson, *Armed Forces on a Northern Frontier: The Military in Alaska's History, 1867-1987* (New York, NY: Greenwood Press, 1988), 12.

Canadian names to help meet the sudden demand. The Canadian government quickly amended its regulations to prevent such outsourcing and spur growth in its aviation industry.[157]

On both the American and Canadian sections of the DEW Line, surplus World War II aircraft from around the world moved some of the most sophisticated equipment north. Equipment designed to detect modern, high-speed bombers moved north in piston-powered aircraft. Scientists designing cutting-edge radar equipment flew in fabric-covered aircraft from site to site. Construction relied heavily on the previous generation's aircraft and transportation methods in an attempt to deter another war. The United States, and as a result, Canada saw the DEW Line as a national security imperative and placed a high military priority on constructing and supporting the sites.

The aviation industry in the North transported large quantities of sophisticated electrical equipment to remote locations. During the airlift, the United States employed the newest and largest cargo aircraft in the western world. The airlift's success in most locations rested almost entirely on small bush planes transporting small teams to proposed radar sites to clear snow and build runways. In the spring of 1955, pilots in the North operated much like they always had; they flew by the seat of their pants. Initially, small aircraft flew in hazardous weather conditions to questionable locations with no modern navigational beacons to guide them. Small bush aircraft provided a fast, flexible mode of transportation over the larger transport aircraft that flew between southern logistics hubs and the larger radar sites moving cargo and personnel for distribution along the line. In addition, these smaller aircraft adapted to the seasons by switching between pontoons, wheels, and skis.

[157] Lackenbauer, Heidt, 102.

The DEW Line construction became the single largest Arctic construction project of its time. The transportation infrastructure development forever shattered the myth of an inaccessible North. The United States and Canada had daily flights to the furthest reaches of their domains. Canadian retained control over the radar sites on its soil, owning the ground and employing its citizens, demonstrating Canadian sovereignty in the far North. After a visit to the line, N.R. Crump, the president of the Canadian Pacific Railway, stated about the project, "It has established airports across the Northland, and the day of the dog team and the old riverboat are gone. It has pushed back the frontier in time by 50 years."[158] Canadians now made daily trips to the far-North, something only a select few did before 1955. With that came the attention of the Canadian government, infrastructure development, and changing economies.

Aviation saw widespread use by the Navy during its exploration for oil in Pet 4. The Navy integrated aviation into almost every aspect of its operation. With the construction of the DEW Line, aviation built upon previously used techniques adjusted to the unique demands required for the project. The use of aviation became a multi-national priority, far exceeding anything previously in the North. Once the DEW Line entered service in 1957, flights to the North became routine. With the routine nature of northern transportation, scientific and commercial exploration followed. By the 1960s, commercial oil exploration crept into Alaska, supported by a more robust aviation infrastructure.

[158] "DEW Line Spurs Development of Arctic 50 Years," *Fairbanks Daily News-Miner*, September 21, 1955, 1.

Chapter 5 Aviation and Oil Come of Age

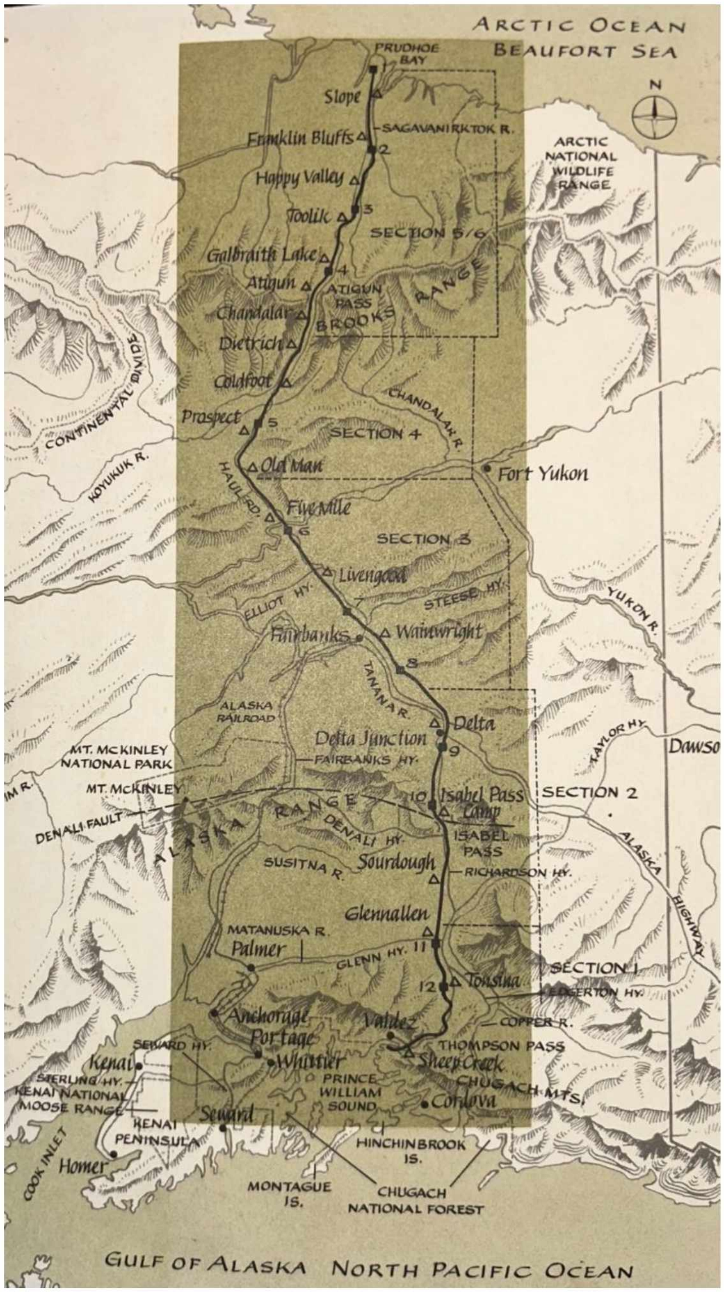

Figure 12. Haul Road and Pipeline map. Robert Douglas Mead, *Journeys Down the Line: Building the Trans-Alaska Pipeline* (New York, NY: Doubleday, 1978).

5.1 Introduction

A C-130 droned through the air, having departed Fairbanks and crossed the Brooks Range, the demarcation line between the boreal forest of the interior and the permafrost-laden tundra of the North Slope. A crew stood by at a drilling site, ready to receive the aircraft. In the distance, the aircraft came into view and dropped onto the snowy 5,000-foot runway. Immediately the crew put the propellers into reverse thrust with an ear-splitting roar using less than half the runway to stop. Within twelve minutes, the crew on the ground and the crew chief disgorged 44,000 pounds of cargo consisting of drums of oil and drilling pipe. With that, the aircraft departed for more cargo.

The popular modern image of Alaskan oil usually centers around Prudhoe Bay and the Trans-Alaska Pipeline System (TAPS) that runs from the Arctic Ocean to Valdez, Alaska. Oil seepages had long been known for centuries in Alaska but did not get serious corporate attention until after World War II. Before the discovery of oil on the North Slope, the Richfield Oil Company discovered oil at its Swanson River No. 1 well on the Kenai Peninsula in 1957. Overnight, the Kenai Peninsula and Cook Inlet became the epicenter for oil and natural gas exploration. The Kenai remained the center of Alaskan oil production until the ARCO-Humble discovery of oil at Prudhoe Bay in late 1967.

With the exception of the ill-fated Hickel Highway, a winter road cut through the wilderness from Livengood to Prudhoe Bay in late 1968, no overland road existed to the North Slope. An all-weather land route would not come into existence until the completion of the Dalton Highway in 1974, built to support pipeline construction activity. This chapter will demonstrate how aviation supported Alaskan oil exploration and the development of the Prudhoe Bay oil field. Alaska's oil boom in the late 1960s and early 1970s, built upon existing aviation

Pet 4 and DEW Line infrastructure, allowed oil companies to explore and develop isolated areas rapidly. Oil companies exploring the North Slope had the benefit of experienced air carriers adept at Arctic flying as a result of decades of supporting Pet 4 and DEW Line construction and resupply operations. New aviation technology created for military use and adapted to the civilian market provided aircraft that could move more cargo to unimproved and austere locations. Existing airfields provided entry points into the Prudhoe Bay oilfield to develop more infrastructure exploited by modern aircraft with increased cargo-carrying capability.

5.2 Oil Discovered on the Kenai

Explorers dating back to the Russian occupation of Alaska and Alaska Natives before them knew of oil seepages on the Kenai Peninsula. After a brief flurry of oil production in the early 1900s, the short-lived oil boom collapsed, in large part to the high cost of production, the harsh environment, and the failure to obtain large quantities of oil.[159] By the 1950s, oil and gas exploration in Alaska benefitted from the previous military oil projects in the North. The Navy's oil exploration in Pet 4 and the Canol Pipeline Project by the Army largely shattered the myth of the impenetrable Alaskan winter. The wartime accomplishments demonstrated the feasibility of oil exploration in the North.[160]

Commercial oil companies began exploring the Cook Inlet region and drilling test wells as early as 1953. Scientists explored from northeast of Anchorage to as far away as Yakutat and Yakataga along the gulf coast. The Richfield Oil Corporation sent geologists Bill Bishop and Ray Arnett to the Kenai Peninsula in 1955 to lead its oil exploration efforts. Richfield directed its

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[159] George C. Martin, "Preliminary Report on Petroleum in Alaska," Preliminary Report on Petroleum in Alaska § (1921), 9.
[160] Kay J Kennedy, "Major Oil Find on Kenai Speeds Alaskan Petroluem Exploration," *Fairbanks Daily News-Miner*, November 20, 1957, pp. 141-142, 142.

exploration efforts in the Kenai National Moose Range near the Swanson River. A year prior, the Secretary of the Interior, Douglas McKay, ruled that multiple uses of withdrawn federal lands were in the best interest of the United States and the citizens of Alaska.[161] The ruling opened the two-million-acre range for leasing and exploration.

For the next two years until 1957, outside private capital financed the drilling of over one hundred wildcat wells on the Kenai Peninsula without finding commercial quantities of oil.[162] On July 23, 1957, the Richfield Oil Corporation struck oil at a depth of approximately 11,000 feet, the first major discovery of oil on the Kenai Peninsula. As legend has it, Bill Bishop seeing a hemlock tree, rare for that area, dug his heel into the dirt near the tree and marked the location for the Swanson River Unit 1 well. By September 1957, oil flowed at a rate of 900 barrels a day. The discovery of oil ushered in the beginning of the modern petroleum industry in Alaska.[163]

Oil and the construction boom that followed accelerated development on the northwest side of the Kenai Peninsula. The city of Kenai transformed from a rural area consisting of homesteaders to a "first class city" as defined by the State of Alaska, complete with a city council and mayor within three years of Richfield's oil discovery.[164] Over the next decade, the population of the greater Kenai and Soldotna area increased from a few hundred to about one thousand by 1970 as a result of the find.[165] Two years later, in 1959, Alaska gained statehood

[161] Claus M Naske, "The Kenai National Moose Range," Environmental Conservation Online System, accessed December 8, 2022, https://ecos.fws.gov/ServCat/DownloadFile/2321?Reference=2359, 130.
[162] Claus-M. Naske and Herman E. Slotnick, *Alaska: A History of the 49th State* (Norman, OK: University of Oklahoma press, 1994), 236.
[163] Neil Davis, *Energy/Alaska* (Fairbanks, AK: Univ. of Alaska Press, 1984), 201.
[164] Harry F Lins , "Energy Development at Kenai, Alaska," *Annals of the Association of American Geographers* 69, no. 2 (June 1979): pp. 289-303, 292.
[165] Richard B Norgaard, "Petroleum Development in Alaska: Prospects and Conflicts," *Natural Resources Journal* 12, no. 1 (January 1972): pp. 83-107, 94.

and, in 1961, opened up leasing on tidal and submerged lands in the nearby Cook Inlet. The state took in $14.6 million, a financial windfall for the new state struggling to make ends meet.[166]

5.3 Rotor Blades and Oil Rigs

Helicopters had operated in Alaska since 1943 when the U.S. Army brought up the Sikorsky YR-4, nicknamed the "Arctic Jitterbug." The helicopter showed promise, but the technology needed more development. In 1948 Carl Brady brought the first commercial helicopters to Alaska to conduct aerial survey work for the U.S. Geological Survey (USGS). The USGS had previously spent seven years surveying the lower half of Chichigof Island near Juneau; Brady got the contract to survey the more mountainous northern half and finished the work in three months.[167] In doing so, Carl proved the helicopter's utility in Alaska's remote regions.

By the time the Richfield Oil Corporation discovered oil on the Kenai, Brady's company, Economy Helicopters, flew two S-55s, a ten-seat, three-bladed helicopter supporting the Rowan Drilling Company moving exploration crews around the Alaska Peninsula. In 1958 to meet the growing demand to support the oil and gas industry, Economy Helicopters merged with Rotor-Aids, forming ERA Helicopters. Soon the company had a contract with Standard Oil supporting oil and gas activities. Rowan Drilling, a Texas-based company, understood the value of helicopters to their operation. In 1954 Rowan began using helicopters to move crews to and from their oil rigs in the Gulf of Mexico and extended this to Alaska. By the mid-1960s, Rowan Drilling began to move further north and, by 1966, had an operational oil rig in Cook Inlet.

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[166] George William Rogers, *The Future of Alaska: Economic Consequences of Statehood* (Washington, DC: RFF Press, 1962), 201.
[167] "ERA Founder Carl Brady Dies at 85," Alaska Journal, August 28, 2005, https://www.alaskajournal.com/community/2005-08-28/era-founder-carl-brady-dies-85.

Seeing the need for increased aviation use, Rowan expanded their business and purchased ERA in 1967 to serve its growing footprint within Alaska.[168]

5.4 Planes, No Trains, and Inefficient Routes for Automobiles

Oil and gas production on the Kenai Peninsula and in Cook Inlet began to shift the Alaskan economic base from defense to petroleum; oil companies turned their attention north. Starting in the late 1950s, the Bureau of Land Management, followed by the State of Alaska, held oil lease sales on land east of Pet 4 and in the vicinity of Prudhoe Bay. Initially, geologists concentrated their exploration efforts along the foothills near Umiat, picking up where the Navy left off in their exploration.[169] The issue of transportation still remained an issue; no overland route existed. Aviation and barging by ocean remained the only two means of transportation north for personnel and equipment, as it had for the Navy.

While oil companies turned their eyes north to Alaska, the USAF issued a Request for Proposal for a new transport aircraft. The Air Force wanted a turboprop aircraft that could operate from short, unimproved airstrips capable of carrying 30,000 pounds.[170] Lockheed won the contract, and the C-130 Hercules made its initial flight in 1954. A four-engined, high-wing aircraft, the Hercules' stalky fuselage sat low to the ground, ideal for loading and unloading cargo. The first aircraft rolling off the assembly line had a carrying capacity of 40,000 pounds, exceeding the requirement. By the time exploration began on the North Slope, the C-130 had

[168] "ERA Group Celebrates 70 Years of Service," Bristow Group Inc., February 13, 2018, https://www.bristowgroup.com/news-media/press-releases/detail/413/era-group-celebrates-70-years-of-service.
[169] Jack Roderick, *Crude Dreams: A Personal History of Oil & Politics in Alaska* (Fairbanks, AK: Epicenter Press, 1997), 135.
[170] Kenneth P Werrell, "The Dark Ages of Strategic Airlift: the Propeller Era," *Air Power History* 50, no. 3 (2003): pp. 20-33, 26.

more powerful engines, pushing 4,500hp each, and could carry 16 tons non-stop from the U.S. to France.[171]

To help solve the transportation problem, Alaska Airlines, supported by Richfield, approached Lockheed about possibly leasing one of their new L-100s, a civilian version of the C-130.[172] Two months after FAA certified the aircraft for civilian use, in April 1965, Lockheed had their L-100 on a one-month lease to Alaska Airlines. Within days, Alaska Airlines put the L-100 to work hauling bulldozers, storage tanks, prefabricated sleeping units, and fuel to Richfield's main staging area along the Sagavanirktok River named SAG-1.[173] In the one month Alaska leased the L-100, the aircraft moved over two million pounds of cargo to various locations north of the Brooks Range. The successful demonstration of the L-100's ability caused Charles Willis, Alaska Airlines president, to say, "This aircraft can airlift heavy machinery, large, earth-moving equipment, and prefabricated structures on the same day at less cost than by conventional surface means."[174] The Hercules moved large equipment to the astonishment of the workers who had fully expected to assemble large tractors on site, only to see them roll out the back of the aircraft ready to work. The new aircraft meant larger loads of equipment moved faster to the remote work locations.

Air transport technology had finally caught up with the demands of the oil industry with the creation of the L-100. While the airline industry and the military began to convert to jet engines, cargo-carrying aircraft had yet to make the transition. The military proved to be a catalyst for this conversion with the certification of Lockheed's L-100 and its entry into the

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[171] Ibid., 26.
[172] Depending on the source, L-100, Hercules, and C-130 are used interchangeably and will be for this paper.
[173] SAG-1, commonly referred to as Sagwon as a result of aircrews pronouncing the location on the radio.
[174] Joseph Earl Dabney, *Herk: Hero of the Skies* (Lakemont, GA: Copple House Books, 1979), 241.

civilian market. Smaller piston-engined bush aircraft still moved small teams to remote locations, but the C-130 could land where other transport planes previously could not with an unmatched cargo capacity. The aircraft routinely used rough airstrips scraped the day before from the ice, gravel sand bars, beaches, and other unimproved locations. These runways often measured five thousand feet in length, often only using half that on landing using reverse thrust, a short distance for the aircraft size and load it carried[175].

Figure 13. C-130 and dog sled. Jeff Studderrt, photograph (Fairbanks, n.d.), University of Alaska Fairbanks, UAF 1981-11-16

[175] Ibid., 234.

With the introduction of the Hercules in the aviation scene in Alaska, companies could now move dismantled oil rigs from one location to the next quickly. In 1966 after the merger of the Atlantic Refining Company and the Richfield Oil Corporation to form ARCO, the company moved to a location known as the Susie 1 well site. Located sixty miles south of Prudhoe Bay, ARCO needed the oil rig from down in Cold Bay on the Alaska Peninsula.[176] Hercules aircraft began moving the dismantled rig north from Fairbanks. The ensuing airlift to Susie 1 would be the largest in Alaska history, hauling over 100,000 tons of cargo and 100,000 gallons of fuel oil to the site.[177] Flights continued through the spring until the improvised runways thawed and became unusable. Aviation enabled the movement of equipment and personnel from across Alaska, which allowed ARCO to begin drilling by the end of February 1966. To attempt an overland cat train movement from south of the Yukon River or an established camp north of the range would have taken weeks and multiple trips, delaying construction. Delays meant more money spent maintaining crews in the field dragging out the exploration. The airlifted Susie site rig eventually became the rig that famously discovered oil at the State No.1 well site at Prudhoe Bay.

Agencies in the past had attempted to carve out winter pioneer roads to the North Slope to move large material north. Massive Letourneau land trains briefly crept out of Fairbanks to help support DEW Line construction in the 1950s, Alaskan truckers began pushing for a road in the 1960s. In November 1968, Walter Hickel, governor of Alaska, while originally advocating for a railroad, saw the value in a highway to the North Slope and directed the Department of Highways to cut a road north.[178] The route would start in Livengood, north of Fairbanks, and

[176] Roderick, 200.
[177] Tim Bradner, "Slope Airlift Begins," *The Fairbanks Daily News-Miner*, January 22, 1966, p. 7, 7.
[178] Chris Allen, "The Brief Life and Strange Times of the Hickel Highway: Alaska's First Arctic Haul Road," *Alaska History* 24, no. 2 (2009): pp. 1-29, 8.

cross the Yukon River near Stevens Village, passing through Bettles and Anaktuvuk Pass before ending at Sagwon. The lead tractors reached the airfield at Sagwon in just one hundred days. By mid-February, convoys began rolling north, and within two months, the Department of Highways closed the road due to a foot of water on the ice bridge spanning the Yukon River.[179]

The Hickel Highway highlighted the limitations of overland transportation during that era; the route could not handle year-round traffic. The highway drew the immediate ire of the Alaska Conservation Society, which referred to the Hickel Highway as the boondoggle of the year. The route also threatened the subsistence lifestyle of the local Native populations it passed by. It left a scar across the terrain, and the price tag grossly exceeded the initial bids for its construction. Some trucks with nothing to backhaul south after dropping their loads made their return trip to Fairbanks inside the cargo hold of a Hercules.[180] By the time the road closed for the summer after roughly two months of use, 7,464 tons of cargo had moved north along the highway. The average cost per ton to move the cargo by the Hickel Highway equaled the same amount to move it by C-130, $240 per ton.[181] Depending on the aircraft, carriers charged as low as $140 per ton.

Supporters of the Hickel Highway saw the land route as a way to undercut the use of aviation and lower transportation costs. Political leaders in Alaska and prominent citizens acted as "boosters" for the development of a Haul Road they envisioned would open up access to mineral and petroleum wealth. Sitting on the sidelines, Alaskan truckers saw dollar signs in the Hickel Highway and pressured the new governor, Keith Miller, to keep the route open for a second winter. Conspicuously absent from the clamor to continue to fund the Hickel Highway,

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179 “North Slope Road Closed,” *Fairbanks Daily News-Miner*, April 14, 1969.
180 “Hickel Highway Was Boondoggle,” *Fairbanks Daily News-Miner*, July 23, 1969, p. 4, 4.
181 Allen, 19.

the oil companies remained indifferent to the route. That winter of 1969, the oil industry had no plans to use the winter haul route to support its construction activities.[182] Limited summer barging and the robust use of aviation provided the necessary materials for the oil industry to continue its development of the North Slope oil fields.

5.5 The Black Gold Rush

In February 1968, ARCO's State No. 1 well struck natural gas and oil at the rate of 1,152 barrels of oil a day.[183] Under a veil of secrecy, ARCO moved a second drilling rig from the mouth of the Colville River seven miles southeast to its Sag River No. 1 well site. Geologists had reason to believe, through seismic and subsurface testing, that larger quantities of oil existed. Proximity to the Sag River also provided gravel for constructing an airstrip. ARCO wanted to run an operational airstrip in the summer months, and the banks of the Sag River provided an ideal location.[184] The location proved fortuitous, ARCO, partnering with Humble Oil, tapped into one of the largest oil fields in the world.

The ARCO and Humble discovery of oil made other companies take a renewed interest in their lease holdings on the North Slope. The lack of infrastructure posed a problem; no year-round overland route existed, and a narrow window in the summer existed when barges arrived at the oil fields. Oil companies constructed rudimentary airstrips adjacent to drill sites where none existed before. Preexisting airstrips at Umiat and Sagwon served as logistics hubs, built initially to support previous military operations. Improved, year-round airfields flanked Prudhoe Bay at Barrow and Barter Island. By the spring of 1969, the number of companies drilling on the

[182] "Conservation Group Against Hickel Road," *Fairbanks Daily News-Miner*, December 19, 1969, pp. 8-8, 8.
[183] Kent Brandley, "Arctic: 1,152 Barrels a Day From One Well at Prudhoe Bay," *Fairbanks Daily News-Miner*, March 13, 1968, XLVI edition, 1.
[184] Roderick, 221.

North Slope rose to thirteen, up from four a year prior.[185] The increase in drilling and exploration activity increased aviation activity in an area with limited aviation infrastructure. Ready to meet these challenges existed a northern aviation community with decades of experience with modern aircraft.

The summer of 1968, British Petroleum (BP) scrambled to get a rig north to their Putuligayuk River or Put River drill site, six miles south of the ARCO well. The main drill rig moved on a barge to Put River while five chartered C-130s and other aircraft moved more than 25,000 tons of equipment to a newly constructed airfield adjacent to the drill site. Aircraft moved two additional drill rigs and all the necessary equipment for drilling to commence.[186] The rapid movement of equipment and supplies by air allowed BP to create an entire drilling site where none existed before. Ultimately, BP's Put River site sat on top of nearly 5 billion barrels of oil.[187]

As oil activity increased in 1968, authorities brought the airfield at Umiat back online as one of the few all-weather airstrips in the region. Originally constructed by the Navy during its exploration of Pet 4, the airstrip became a vital hub in the central interior region of the North Slope. The Air Force took control of the camp and airstrip at Umiat to support DEW Line activities. Transferred from the FAA to the State of Alaska in 1966, the airstrip saw sporadic use prior to the discovery of oil at Prudhoe Bay. Northern Consolidated Airlines operated a navigational beacon at the airstrip that the FAA soon brought into the air traffic control system for broader use and safety oversight.[188]

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[185] J. Fraser Hart, "Oil Rush on the North Slope of Alaska," *Geography* 55, no. 4 (November 1970): pp. 448-451, 448.
[186] Roderick, 226.
[187] Frank Baker, "Bidding Around the Edges," n.d, A11.
[188] Theresa L. Kraus, *Civil Aviation Policy in Alaska, 1913-2018* (Washington, DC: United States Department of Transportation, Federal Aviation Administration, 2020), 134.

The Sagwon airstrip, located just south of the confluence of the Sagavanirktok and Ivishak rivers, became the hub for Interior Airways. The location proved vital during the movement of equipment and supplies for the Susie No. 1 well, which turned out to be a dry hole. The airstrip served as a logistics hub to offload ARCO equipment and supplies for movement to the Susie site and the subsequent construction of a winter airstrip.[189] The region has been host to exploration activity dating back to the Navy's exploration of Pet 4, but no serious aviation infrastructure development had occurred. In 1964 construction began on a 6,500-foot-long, 200-foot-wide runway capable of handling the largest of Interior Airways' aircraft.[190] Soon the airfield had a control tower and navigation beacon. Like Umiat, the FAA certified the navigational beacon for use in routing.

Much like the DEW Line, almost every drill site had an adjacent airstrip to quickly move equipment and supplies. In 1969, the North Slope saw a frenzy of aviation activity. The corridor surrounding Prudhoe Bay, roughly eighty miles long by 50 miles wide, housed forty-five airstrips.[191] Demand for aviation services increased across northern Alaska. The Flight Service Station (FSS) at Barrow saw demand increase five-hundred percent in 1969, and the Bettles FSS saw an increase in traffic of eighty-seven percent.[192] The Navy used Bettles and Barrow extensively during the exploration of Pet 4 and supported operations during the DEW Line construction and resupply. By 1960 with the growing need for aviation services, the State of

[189] "Looking Back, to Beginning, Startup," *The Explorers*, May 28, 2017, pp. 40-50, 45.
[190] Jim Magoffin, *Triumph Over Turbulence: Alaska's Luckiest Bush Pilot* (Sarasota , FL: BookWorld Services, 1993), 192.
[191] "FAA, State Improve North Slope Nav-Aids," *Fairbanks Daily News-Miner*, October 28, 1969, A-8.
[192] Kraus, 133.

Alaska began construction on a civilian airport in Barrow. To support the larger transport aircraft frequenting the airport by 1969, it boasted a paved 6,500-foot runway.[193]

Aviation became the primary means of transportation to the Prudhoe Bay oil field. Barging still took place during the summer months, and winter cat trains moved large equipment from site to site. Teams routinely moved equipment flown into Sagwon by cat train to their final destinations. In 1969 companies had to rely on barging to move equipment too large for aircraft to move. The use of helicopters expanded during this time in both the military and civilian sectors. Rowan Drilling Company, who owned ERA Helicopters, purchased two Sikorsky S-64 Skycranes, the first two civilian variants of the Army's CH-54 Tarhe, for use on the North Slope. The same company that proved the utility of helicopters servicing the Kenai and Cook Inlet oil fields. ARCO famously used the S-64 to move an entire drilling rig broken into twenty-ton loads. It became the most expensive helicopter operation on the Slope.[194] Seventy-five helicopters operated on the North Slope, and the FAA projected that six-hundred helicopter flights per day would take place in the second half of 1969.[195] From the Kenai Peninsula to the North Slope, helicopters became indispensable with their unique vertical takeoff, landing, and sling loading capabilities.

The concentration of drilling rig sites and other construction projects on the North Slope in 1968 and 1969 kicked off the largest civilian airlift in Alaska's history. In nine months of flying north from Fairbanks, aircraft moved 430,000 tons of equipment to drill sites despite

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[193] "Barrow Airport Master Plan Update - Alaska," State of Alaska Department of Transportation (PDC Inc. Engineers, December 2013), https://dot.alaska.gov/nreg/barrowmp/, 1-4.
[194] Rose Ragsdale, "Oil Rush Lifts Aviation Fortunes," *Harnessing a Giant: 40 Years at Prudhoe Bay*, October 2008, 74.
[195] Mike Dalton, "Secrecy Befouls FAA's Job," *Fairbanks Daily News-Miner*, August 18, 1969, A8.

adverse weather and winter conditions.[196] To put this in perspective, in the thirty-two months it took to construct the DEW Line, aircraft moved 140,400 tons of cargo, and in total, all modes of transportation moved 459,900 tons.[197] In those nine months, aircraft moved ninety-three percent of the tonnage moved during DEW Line construction. The Prudhoe Bay airlift enjoyed modern aircraft technology with increased payload capabilities that could operate in austere environments. Airfield construction allowed an increase in aircraft activity. By the summer of 1969, nine all-weather airfields served the oil field compared to three a year prior.[198]

5.6 ANCSA, NEPA, and the Pipeline

A way to bring oil to market had been the elephant in the room during the initial development of the Prudhoe Bay oil field. While a pipeline seems the most logical choice, oil companies floated ideas that proved less feasible. Humble Oil experimented with an ice-breaking oil tanker when the SS Manhattan traversed the Northwest Passage. General Dynamics proposed a fleet of nuclear submarines capable of carrying 170,000 tons of oil.[199] In the end, ARCO, Humble, and BP decided that a pipeline from Prudhoe Bay to Valdez provided the best option to move North Slope oil. Together the three companies formed the Trans-Alaska Pipeline System.

Before the discovery of oil, then Secretary of the Interior Stewart Udall placed a freeze on Alaska's selection of any more land as promised in the Statehood Act of 1959 until the state settled Alaska Native land claims. Most of the land selected by the state had received tentative approval from the Bureau of Land Management but had yet to receive final approval. Native Alaskans contested the land transfer prompting Udall to stop the land transfer. Undaunted by this

[196] Ibid., A8.
[197] *The DEW Line Story* (New York, NY: Western Electric Company, 1958), 24.
[198] Dalton, A8.
[199] "Oil-Carrying Submarine Study Planned by Canada," U.S. Naval Institute, September 6, 2019, https://www.usni.org/magazines/proceedings/1970/march/notebook.

land freeze TAPS went ahead in 1969 and purchased 800 miles of forty-eight-inch steel pipe from Japan. Almost overnight, after riding the high of a massive oil discovery, the oil companies ground to a halt.

One more issue for the oil companies to contend with happened in January 1970 when President Richard Nixon signed the National Environmental Policy Act into law. Work slowed even further as oil companies had to contend with new environmental regulations and lawsuits filed by environmental organizations trying to stop work. Energized by the lease sale that brought in over $900,000,000, businesses expecting high demand made significant investments and found it hard to avoid bankruptcy. Interior Airways, with thirty aircraft on its books in 1970, ranging from small Cessna 180s to their C-130s, entered into Chapter 11 bankruptcy. The lack of demand for the expensive aircraft forced the company to reach a deal with creditors to avoid closing for good.[200]

With the passage of the Alaska Native Claims Settlement Act in 1971 and the Alaska Pipeline Authorization Act in November 1973, work on the pipeline could finally begin. In April of 1974, construction resumed on the Haul Road that would become the Dalton Highway. North of the Yukon River at 5 Mile Camp, crews built the first TAPS airstrip into the Haul Road to move in supplies and personnel and construct nearby Pump Station 6. Ground crews put up barricades on the road to stop traffic allowing aircraft to land directly on the Haul Road. The construction of the Haul Road triggered another massive airlift for the pipeline that followed. Ultimately, it took fourteen airfields to support 29 construction camps that built the pipeline.[201]

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[200] Magoffin, 248.
[201] "Celebrating TAPS 40th Anniversary Remembering Hercs, Helicopters, & Airfields," n.d, 1.

During the height of the pipeline build-up in 1974, six C-130s operated out of Fairbanks around the clock. These aircraft moved one million pounds of cargo daily, made up of drilling pipe, drilling mud, cement, large equipment, and prefabricated buildings.[202] Utilizing C-130s, crews could move entire construction camps from one location to another, moving upwards of 1,200 mobile home units in 1974.[203] While an expensive mode of transportation, roughly ten times the price of barging, in a time-critical situation, construction crews turned to aviation to avoid costly delays and inaction. In the first two years of pipeline construction, aircraft transported over 80,000 tons of freight per year.[204] With the completion of the Haul Road from Livengood to Prudhoe Bay, surface transportation picked up a significant portion of the freight load. Trucks began running upwards of 300,000 gallons of fuel daily to construction locations along the Haul Road.[205]

The 800-mile pipeline took three years to complete at the cost of $8 billion. The project became the world's largest privately funded construction project at the time of its construction.[206] The first oil entered the pipeline on June 17, 1977, and reached Valdez over a month later due to leaks and mechanical issues along the line. At the height of the oil boom, over two-hundred aircraft supported oil field operations, and during pipeline construction, over 28,000 workers worked to construct the pipeline. Alaska International Airways, formerly Interior Airways, boasted the world's largest civilian fleet of C-130s.

[202] Larry O Kitchen, "Innovations in Transportation," *Defense Transportation Association* 31, no. 6 (December 1975): pp. 35-36, 35.
[203] Dabney, 241.
[204] Robert Douglas Mead, *Journeys Down the Line: Building the Trans-Alaska Pipeline* (New York, NY: Doubleday, 1978), 214.
[205] Ibid., 214.
[206] ConocoPhillips Alaska "Trans-Alaska Pipeline System (TAPS)," accessed January 6, 2023, https://alaska.conocophillips.com/who-we-are/alaska-operations/trans-alaska-pipeline-system-taps/#:~:text=The%20Trans%2DAlaska%20Pipeline%20System,a%20cost%20of%20%248%20billion.

5.7 Conclusion

The discovery of oil on the Kenai Peninsula enjoyed the benefit of access that the companies exploring Prudhoe Bay did not. While still somewhat remote, the Kenai had rudimentary roads that provided access to major population centers. Companies seeking to exploit the newfound oil improved ground transportation routes and began constructing new infrastructure almost overnight. Helicopters had already proven their worth in Alaska and became the aircraft of choice for exploration. Aviation during the Kenai oil boom served to supplement existing modes of transportation.

The discovery of oil at Prudhoe Bay occurred at a pivotal time in civilian aviation. The turbine engine used in high-performance military aircraft and civilian airlines found its way into propeller-driven aircraft and helicopters. Using military-designed transportation aircraft approved for civilian use transformed Prudhoe Bay exploration and construction. Oil companies had brand-new aircraft technology at their disposal that the Navy exploring Pet 4 and those building the DEW Line did not. Oil companies, willing to pay higher prices to ship by air, understood the bigger picture of the money that could be made by developing Prudhoe Bay.

Preceding the discovery of oil at Prudhoe Bay, aviation infrastructure existed on the North Slope to support exploration. Locations at Bettles, Barrow, Umiat, and Barter Island provided jumping-off points and logistics hubs to support initial movement into the area. Lacking any viable land route north of the Yukon River, aviation became the main means of transportation north. Barging moved large pieces of equipment but could only operate for a few weeks during the middle of the summer, depending on the ice. Aviation made Prudhoe Bay accessible in ways no other means of transportation could at the time and allowed the rapid development of the oil field. The faster aviation delivered cargo north, the faster development occurred, creating the need for more aviation assets. Infrastructure on the North Slope benefitted as well. Barrow received a new all-weather civilian airport when oil traffic exceeded the Navy's capacity at their airstrip. The Deadhorse strip transformed into the oil field's main aviation hub, which is still in use today. Without aviation, the development of the Prudhoe Bay oil field would have still happened, but at a much slower pace.

Chapter 6 Conclusion

Passengers sit in typical airport seats waiting for their flight at gate L-1 in a no-frills terminal at Ted Stevens International Airport in Anchorage, Alaska. The gate, operated by ConocoPhillips, moves workers to and from their two locations on the North Slope. As scheduled, flight 1132 arriving from Alpine taxis to the gate. The high pitch shriek of the turbines suddenly goes quiet and is replaced by the whooshing sound of feathered propellers as they slow to a stop. The passengers, some using a mobile app, scan their boarding passes and head toward the aircraft. The plane is one of three De Havilland Q400 twin-turboprop aircraft owned by ConocoPhillips that flies daily between Anchorage and their sites along the Colville River (Alpine) and Kuparuk. The red and white Q400s operate up to six flights daily, five days a week. Aviation remains the life blood of the oil industry transporting workers to and from their work sites.

Alaska Airlines routinely flies to Deadhorse, the main commercial airport at Prudhoe Bay, with flights in the morning and afternoon transporting oil industry workers and the occasional tourist north and back. Aviation remains the primary mode of transportation for personnel and priority cargo to the oil fields. The Dalton Highway, the only year-round road to Prudhoe Bay, functions in the same manner it did during construction, transporting routine and oversized cargo north. One notable exception is the addition of tourist traffic since Alaska opened the entire road for public travel in 1994. Semi-trucks hauling portable buildings and sections of pipe share the highway with motorcycles and tour buses following the pipeline north.

The exigencies of war, technological innovation, and the demand for oil became the catalyst for transportation infrastructure development across the North. World War II and the Cold War brought the Army, Navy, and Air Force to the Arctic in a major way, all developing infrastructure to support its operations. Further expanding aviation infrastructure, the DEW Line brought state-of-the-art technology to the North Slope to defend against possible Soviet aggression. Private-sector oil exploration used this infrastructure as an access point to rapidly develop the Prudhoe Bay oil field. The Canol project proved the viability of pipelines in the North, culminating in the construction of the Trans-Alaska Pipeline.

The infrastructure developed by the United States government and private oil companies did not occur in a vacuum. Aviation and the infrastructure that followed, for better or worse, affected the villages, cities, and people near the projects. Infrastructure changed hands as development occurred. The Navy-built airfield at Bettles transitioned from military to civil government control, and the Haul Road, built by the oil companies, became state property in 1979. Civil aviation followed military construction in the North, as military construction relied on civilian pilots and aircraft for support.

The Northwest Staging Route formed from a series of airfields in the Canadian Northwest initially developed by the Canadians in the late 1930s and improved upon to support United States aircraft movements north.[207] Logistically connecting these far-flung airfields, the Alaska Military Highway provided a ground route to Alaska, and the Canol Pipeline Project supplied fuel along the route. Aviation operations along the route required a steady and large fuel source. On paper, Canol provided the solution to this problem; in reality, the crude oil pipeline from Norman Wells to Whitehorse never lived up to its promise of supplying fuel along the route. The secondary pipelines running from Skagway moving refined fuel to Watson Lake and

[207] Stanley W. Dziuban, *Military Relations Between the United States and Canada, 1939-1945* (Washington, DC: US Government Printing Office, 1959), 206.

up to Fairbanks proved far more successful. The deluge of aircraft moving north prompted the creation of pipelines to feed the fuel-hungry aircraft

World War II and the CAA ended the golden age of bush-flying in Alaska with the development of modern airfields, communication devices, and navigational beacons. The military's increased aviation activity leading up to and during World War II prompted the development of new airfields and the creation of modern airways for aircraft to travel. Anchorage and Fairbanks received military airfields and improvements to civilian airports. The Army and the CAA worked in tandem to develop northern infrastructure in Alaska with the secondary benefit of increasing civil aviation infrastructure. The CAA developed airfields to military specifications, most notably at Big Delta and Nome, two prominent airfields currently still in use.

In the Naval Petroleum Reserve No. 4, the Navy had to start from scratch at Barrow to begin searching for commercial quantities of oil. While air service from Fairbanks to Barrow existed, the lack of aviation infrastructure only allowed for small bush planes to land on beaches and lakes in the summer and on skis in the winter. No runways existed for larger transport aircraft when the Navy ships arrived in the late summer of 1944. In contrast to the Army in Northwest Canada, whose construction revolved around supporting aviation, the Navy used aviation to support oil exploration. Once established on the beach, the Navy's construction battalion made airfield construction a top priority to get equipment and supplies moving from Fairbanks. That winter, cat trains crawled southeast to a location on the Colville River called Umait, carrying equipment to build an ice runway and establish a camp. With no ground route north, the Navy established a line haul between Fairbanks and Barrow, moving personnel and equipment north in larger transport aircraft to supplement the annual barges in the summer. The

Navy established year-round aviation infrastructure at Barrow, Umiat, Bettles, and Barter Island and pioneered the use of aviation to support small teams in the field. Larger aircraft moved equipment and personnel north, and smaller aircraft then moved laterally within the Reserve. Oil companies continue to use this technique. The infrastructure created by the Navy became the first modern aviation infrastructure on the North Slope. The Air Force adopted these practices and assumed control of the Navy infrastructure to build the DEW Line in Alaska rapidly.

The development of aviation infrastructure and the increased air traffic that followed spurred the CAA to install new communications equipment and navigational equipment at the Navy's newly constructed airfields. Bettles received communications equipment and a flight service station before the CAA eventually took control of the airfield.[208] Umiat and Barrow received new equipment as the military and civilian sectors fed off one another to develop the North. The Navy relied on a mix of military and civilian aviation assets for logistical support, contracting with a variety of air carriers using large transport aircraft and small bush-planes during its tenure in the North. Once World War II ended, the exploration took on a civilian face with the contracting of Arctic Contractors to carry out the rest of the exploration.

Both the Army and Navy heavily relied on aviation to support construction and exploration activities. The Army benefitted from pre-existing airfields, although rudimentary at the start of the war, to begin moving aircraft and equipment north. With the construction of the Alcan and the Canol pipeline over White Pass, the burden on transportation aircraft eased. The Navy relied almost exclusively on aviation to move equipment north between the once-a-year Barrow Expedition barges moving heavy equipment north in the summer. The Navy

[208] Kraus, 62.

incorporated aviation into almost every facet of its transportation and resupply plans. Cat trains and weasels relied on aviation for route marking and supply caching to sustain themselves, and bush planes moved survey teams from site to site.

The Navy ceased exploration activities and began handing over facilities to the Air Force in 1953. Tension between the United States and the Soviet Union drew military attention to the Arctic. The Polar Concept, the assumption that the Soviets would attack over the North Pole much in the same manner the United States planned to attack, drove a militarization of the North. The Air Force planned a chain of radar sites across northern Alaska and Canada. The DEW Line, for its time, became the largest construction project in the North, supported by the largest commercial airlift ever seen in the North American Arctic. Construction of the DEW Line proved the viability of large-scale construction projects in the Arctic and further developed infrastructure. Travel to the Arctic became as routine as flights between Alaska and Seattle, providing direct connections to the North.

While the DEW Line seemed to be one continuous chain of radars, it spanned three countries, the majority of which rested in Canada. As a result, the Air Force took two different approaches. In Alaska, the Air Force worked with civilian air carriers for air cargo movements utilizing existing military-built installations and building new infrastructure. Contracted air carriers still moved equipment and supplies to the Reserve; the DEW Line contractors carried on this practice to support construction and personnel movement. Along the DEW Line, crews constructed runways adjacent to the radar sites for resupply capable of handling large Air Force cargo aircraft or small bush planes, depending on the location of the radar.

The Air Force operated in the background in Canada, only supplementing cargo movements when absolutely necessary. During World War II and the mega-projects in

Northwest Canada carried out by the United States, Canadian officials worried about their national sovereignty. Their worries carried over into the Cold War. Canadian government officials mandated that the United States use Canadian construction companies and air carriers to complete the project. Seventy-five percent of the DEW Line sat on Canadian soil, and Canadian officials had ample cause for worry. Canada lacked the infrastructure in the Arctic that existed in Alaska, and crews started from scratch. Coming out of World War II, the Canadian aviation industry suffered from demobilization and a lack of adequate surplus transport aircraft that the Americans enjoyed. The air cargo requirements forced the Canadian aviation industry to modernize and grow as a result. Through mergers and buyouts during construction, the Canadian aviation industry grew from several small unreliable carriers to larger, more sustainable companies still in use today. The DEW Line developed infrastructure in the North and created regular air service to the Canadian Arctic.

After World War II, the United States and, eventually, Canada began to transition away from piston-powered aircraft to jet-powered ones. The Soviet's development of a nuclear bomb only accelerated the transition. The DEW Line represented the pinnacle of technology, detecting Soviet bombers and guiding new, modern jet fighters to intercept enemy bomber formations. Moving all of this highly sophisticated equipment north, the Air Force depended on a fleet of World War II-era piston-powered transport aircraft of aircraft designed just following the war. Historian Kenneth P. Werrell referred to this era in transport technology as the "Dark ages of strategic airlift."[209] During World War II, military and civilian cargo aircraft evolved from civilian-designed aircraft modified for cargo use, the same aircraft that supported DEW Line

[209] Kenneth P. Werrell, "The Dark Ages of Strategic Airlift: the Propeller Era," *Air Power History* 50, no. 3 (2003): pp. 20-33.1.

construction. The Air Force's workhorse, the C-124, while purpose-built as a transport, relied on outdated technology, which limited its capabilities. Coming out of this era, the Lockheed C-130, with its four turboprop engines, became the modern, rugged aircraft to fuel rapid expansion in the North.

The construction of the DEW Line proved the viability of large-scale construction projects in the North. Still a territory, the federal government began lease sales in Alaska on the North Slope in 1958, which opened the door to private oil exploration. Slowly, oil companies began to move north from the Cook Inlet and Kenai Peninsula to explore the unknown regions east of the Naval Petroleum Reserve No. 4. Existing infrastructure at Umiat, Barrow, and Barter Island provided staging locations to support early exploration. With no reliable road to support exploration, aviation remained the only year-round means of transportation into the region.

The exploration and development of the Prudhoe Bay oil field occurred at an important crossroads in aviation technology. The Air Force developed the four-engined turboprop C-130 which provided impressive cargo-carrying capabilities and could land on small unimproved landing strips. Once certificated for civilian use, Alaska International Airways immediately put them to use moving equipment to the North Slope. The aircraft could quickly move entire drill rigs from one side of Alaska to the other and establish camps where needed. The C-130 moved the oil rig for the Richfield Oil Corporation, which made the initial Prudhoe Bay oil discovery. The availability of modern cargo aircraft accelerated the pace of exploration and construction on the North Slope. Soon, British Petroleum and Humble Oil followed Richfield's lead and began rapidly expanding their exploration using aircraft to move equipment and personnel north from Fairbanks.

Oil companies began to develop new aviation infrastructure to support the expanding oil field, providing their own air traffic control services, communications, and navigation beacons. Soon the Federal Aviation Administration (FAA) incorporated the beacons into the national air traffic control system and installed more navigational beacons to support the increased traffic flow. Airfields at Umiat, Sagwon, constructed by Alaska International Airways for the oilfield, and Deadhorse at Prudhoe Bay became logistics hubs around Prudhoe Bay. Once the federal government allowed the construction of the Trans-Alaska Pipeline, construction of a Haul Road began.[210] Now oil companies had two year-round modes of transportation to move equipment north. As a result, air traffic began to decrease. At the height of the air traffic, the FAA constructed a control tower at Deadhorse in January 1975. By September 1976, less than two years later, the FAA decommissioned the tower as air traffic dropped despite the ongoing construction.[211] Despite the completion of the Haul Road, aviation remained the preferred mode of transportation for time-sensitive equipment and personnel movements to Prudhoe Bay and along the pipeline.

Aviation on the North Slope provided flexibility to the oil companies exploring for oil in a way that no other form of transportation could. The speed at which aircraft moved equipment north increased the pace at which development occurred, which in turn demanded more aircraft. Aviation and the development of Prudhoe Bay proved so successful that the construction of a year-round land route became feasible. With a reliable road north, trucking operations took over routine cargo movements, decreasing the need for aviation. Aviation became a victim of its own success but remained an important part of northern transportation.

[210] Initial construction began in 1969 between Livengood and the Yukon River.
[211] Kraus, 135.

Modern-day airlines still use the major airfields associated with the Northwest Staging Route. Whitehorse is the largest of the Canadian airports along the route north of Edmonton. Air North, an airline based at Whitehorse, provides modern jet service to Northwest Canada. Sitting at the intersection of the Northwest Staging Route, the Alcan, the White Pass and Yukon Railway, and the Canol Pipeline, Whitehorse overtook Dawson City to the north as the economic center of the territory. A distinction still held today.

The airstrips built during the height of the Prudhoe Bay oilfield development and during the Navy's exploration on the North Slope have all but faded away. As a result of the increased air traffic, Barrow received a new airport which is now the main airport for the village. The Navy's strip has since been closed and sits abandoned. Deadhorse, Alpine, and Kaparuk are the primary airports supporting oil production. A drastic reduction from the forty-five airstrips of the 1970s.[212] Nature is slowly reclaiming the once-prominent Sagwon airstrip, while Umiat has lasted the test of time, supporting scientists and survey crews.

Aviation companies formed, merged, or went out of business as a result of military mega-projects and oil production in the North. Air Canada, Canada's largest airline, can trace its lineage to the Northwest Staging Route and the DEW Line construction. Canadian Pacific Airways formed in 1942 after the Canadian Pacific Railway purchased several smaller air carriers that helped to develop the early airfields in Northwest Canada. Pacific Western Airlines in Canada bought out Associated Airways, which held a DEW Line contract and closed its doors after a series of fatal crashes and took over DEW Line support. Both airlines merged with other air carriers through a series of mergers, eventually becoming Air Canada.

[212] Ibid., 134.

Helicopters proved their viability during the development of the Kenai Peninsula and Cook Inlet oil and gas fields. The merger between Economy Helicopters and Rotor-Aids to form ERA Helicopters in the early 1950s left a lasting legacy in Alaska. ERA grew alongside the oil fields, adding more aircraft, including fixed-wing aircraft, as a regional airline. The airline eventually separated from ERA and, after emerging from bankruptcy, is known as Ravn Alaska. After a series of mergers, ERA Helicopters merged with Bristow Helicopters forming one of the largest helicopter operators in the world and still supporting oil exploration and development.

While some of the infrastructure created might not be in use, it contributed to the overall development of the North. Global positioning satellites have rendered navigational beacons almost obsolete but provide a secondary means of navigation if needed. Old airstrips dot the landscape; some still function as support strips for the Haul Road and pump stations along the pipeline. Small bush planes and helicopters flock to Bettles and Coldfoot during summer months, supporting scientific and survey crews in the field. At the time of construction, the airfields had one purpose: to support the region's construction, exploration, and development activities. In doing so, they provided access to the Arctic for generations to come.

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