United States
Department of Defense
Legacy Resource Management Program

The Coldest Front:
Cold War Military Properties in Alaska
Revised and Expanded

Prepared in Cooperation with the
Alaska State Historic Preservation Officer
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Legacy

The Legacy Resource Management Program was established by the Congress of the United States in 1991 to provide the Department of Defense with an opportunity to enhance the management of stewardship resources on over 25 million acres of land under DoD jurisdiction.

Legacy allows DoD to determine how to better integrate the conservation of irreplaceable biological, cultural and geophysical resources with the dynamic requirements of military missions. To achieve this goal, DoD gives high priority to inventorying, protecting, and restoring biological, cultural and geophysical resources in a comprehensive, cost-effective manner, in partnership with federal, state and local agencies and private groups.

Legacy activities help to ensure that DoD personnel better understand the need for protection and conservation of natural and cultural resources and that the management of these resources will be fully integrated with and support DoD mission activities and the public interest. Through the combined efforts of the DoD components, Legacy seeks to achieve its legislative purposes with cooperation, industry and creativity, to make the DoD the federal environmental leader.

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Introduction

From the late 1940s through 1989, Alaska served as America's Cold War sentinel and important air defense shield against the threat of Soviet attack over the North Pole. A threat of global proportion, the Cold War consumed $12 trillion from the U.S. Treasury and spanned nearly the lifetime of a generation of Americans.[1] In the course of the Cold War, America amassed a vast standing army, a global intelligence network, and a military-industrial economic complex. By general convention, 1946 was the year the Cold War began. It was the year of George F. Kennan's Long Telegram[2] and former British Prime Minister Winston Churchill's Iron Curtain speech at Fulton, Missouri.[3] In November 1989, the Berlin Wall came down, and, in December 1991, the Soviet Union dissolved, officially ending the Cold War.

The advent of atomic weapons in the 1940s revolutionized the way American military planners thought about how future wars might be fought. Within weeks after the end of World War II, American strategic military planners had identified 20 Soviet cities as potential atomic targets.[4] By 1949, the Soviets also had the bomb. With the advances in aircraft and missile technologies, delivery of nuclear weapons to one's enemy over the pole became a major threat. This "polar concept" marked a sea change in military strategy.[5] British historian Sir John Keegan observed that 99% of the world's wars were waged between the tropics of Cancer and Capricorn.[6] The Cold War was the first to feature major theaters of operations above the Arctic Circle, assuring a prominent role for Alaska.

After the collapse of the Soviet Union, the United States and its erstwhile enemy, the newly formed post-Soviet states, had enormous defense infrastructures focused on central Europe and the Arctic. Nearly every permutation of the Cold War, from the early years of George Kennan's containment policy through Eisenhower's "massive retaliation," through détente and the "winnable nuclear war," saw either an increase in arctic manpower—most notable during the 1950s—or an advance in or modification of the weapons and communications systems distributed across the circumpolar North.[7] Following the Cold War, substantial components of the West's northern military establishment were taken offline, and the future of a few Alaskan bases is currently in doubt. Nonetheless, the U.S. maintains a military presence in Alaska, serving a global response role first employed in Vietnam and now expanded to support operations in Iraq and Afghanistan.

The Military Situation in 1946

The end of World War II saw the German and Japanese threats extinguished and British and French capacity badly diminished, leaving the United States and the Soviet Union as the preeminent powers in the world, with Soviet and Western forces facing each other in central Europe and across the Bering Strait. The United States, following its bombing of the Japanese cities of Hiroshima and Nagasaki, had proven the world's clear leader in military technology. U.S./Soviet relations rapidly cooled due to arguments over the fate of Europe and a growing sense on both sides of the incompatibility of communism and capitalism. Soviet leader Joseph Stalin

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[1] Betts, Richard K. *Military Readiness: Concepts, Choices, Consequences.* Washington, D.C.: The Brookings Institution, 1995.
[2] Jensen, Kenneth M., *Origins of the Cold War: The Novikov, Kennan, and Roberts "Long Telegrams" of 1946*. Washington, D.C.: United States Institute of Peace Press, 1993, pp. xi-xii. George Kennan, U.S. Charge d'Affaires in Moscow, sent what is known as the Long Telegram on 22 February 1946 from Moscow to Washington. It analyzed Soviet history, society, outlook, and intentions and subsequently influenced U.S. policy toward the Soviet Union. Information presented in the telegram provided the reasoning for what became the policy of containment.
[3] Reynolds, David. *From World War to Cold War: Churchill, Roosevelt and the International History of the 1940s*. London: Oxford University Press, 2006, 249.
[4] Walker, Martin. *The Cold War: A History*. New York: Henry Holt & Co., 1994, 26.
[5] Pagano, Rosanne. "Protecting Northern Skies." *Alaska Geographic* 25, no. 4 (1998): 43–60.
[6] Keegan, John. *A History of Warfare*. New York: Alfred A. Knopf, 1993, 68–69.
[7] Rogers, George. *The Future of Alaska: Economic Consequences of Statehood*. Baltimore: Johns Hopkins Press, 1962, 63.

directed his military to consolidate Soviet gains in Europe, improve air defenses, and redouble efforts to obtain nuclear capability. While Stalin (and Nikita Khrushchev after him) was keen on the development of a ballistic missile, he settled for what the available technology and a strained industrial sector would allow– a long-range strategic bomber force and strategic airfields in eastern Siberia. The Soviet Union also benefited from its late-war production organization and aeronautical technology and material captured from the Germans.[8] By 1952, Soviet bombers were poised to strike the American heartland with bombers based in eastern Siberia.[9]

Intro 1

The Soviets developed and produced Cold War bombers in formidable numbers, starting with the Tupolev Tu-4 "Bull"—really a copy of a U.S. B-29 Superfortress—and mass production of, in particular, the jet-powered Tu-16 "Badger" (1954) and four-engined turboprop Tu-95 "Bear," introduced in 1955 and still in service.[10] They deployed the aircraft above the Arctic Circle and in eastern Siberia in quantities great enough to alert the U.S. Air Defense Command to Alaska's value as the front line for America's air defense.[11] In 1954, Russia's second hydrogen bomb test took place on Wrangel Island, only 500 miles from Nome, Alaska.[12] The point was not lost on U.S. military planners.

As part of General Carl Spaatz's reorganization, the Army Air Force (AAF) established the Air Defense Command (ADC) in March 1946. ADC became part of AAF's operational command triad, complementing the offense-minded Strategic Air Command (SAC) and Tactical Air Command (TAC). ADC's mission was to organize and administer the integrated air defense system of the continental United States. Competing for funds with the longstanding tradition of offensive doctrine and the meteoric ascendancy of General Curtis LeMay and the SAC, ADC emphasized planning for continental air defense in the emerging context of long-range bombers and guided missiles.[13]

In 1946, most American atomic experts thought that the earliest the Soviets could possess an atomic bomb was 1953.[14] The U.S. military began to prepare for the new threat, developing the *polar concept, which* envisioned future air operations across the North Atlantic and Alaska, the shortest distance between American and Russian soil.[15] The idea triggered a host of activities destined to influence air defense developments in North America.

***Intro 2**

Illustrating Alaska's importance to the American defense network, since World War II, Alaska has been called "Guardian of the North," "Gibraltar of the North," "Top Cover for America," "Keystone of the North," and "Northern Defender."[16] The military invested in installations, operational readiness, and nuclear testing, and

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[8] Higham, Robin, and Jacob Kipp. *Soviet Aviation and Air Power: A Historical View.* Boulder, CO: Westview Press, 1978, Chapters 8–12.
[9] Hillman, D.E., and R.C. Hall. "Overflight: Strategic Reconnaissance of the USSR." *Air Power History* 43, no. 1 (1996), 28–39.
[10] Gunston, William. "Russian Bombers Complete 16-hour Arctic Patrol." *Flying*, September 1977, 263, in *Ria Novosti* (*Russian International News Agency*), 30 Jan. 2012. http://en.rian.ru/mlitary_news/20120130/171032114.html, accessed May 2012. The venerable TU-95 completed its first Arctic patrol of the year in January 2012.
[11] Mason, R.A., and John Taylor. "Long Range Aviation," in *Aircraft, Strategy and Operations of the Soviet Air Force*. London: Jayne's Publishing Ltd., 1986, 133–134.
[12] Nielson, Jonathan M. *Armed Forces on a Northern Frontier: The Military in Alaska's History, 1867–1987*. New York: Greenwood Press, 1988, 184.
[13] Schaffel, Kenneth. *The Emerging Shield: The Air Force and the Evolution of the Continental Air Defense, 1945–1960.* Washington D.C.: Office of Air Force History, 1991, 53.
[14] Edwards, Paul N. *The Closed World: Computers and the Politics of Discourse in Cold War America*. Cambridge, MA: MIT Press, 1997, 88.
[15] Schaffel, 58.
[16] Hummel, Laurel J. *Alaska's Militarized Landscape: The Unwritten Legacy of the Cold War*. Doctoral Dissertation: Boulder, CO: University of Colorado, 2002 24.

applied research in innovative technology in Alaska. Expensive defense programs such as Nike and the DEW Line caused President Dwight D. Eisenhower in his farewell address to add a new phrase to the lexicon of the Cold War, "the military-industrial complex."[17] The North American Air Defense Command (NORAD), which oversaw North America's air defense umbrella, was responsible for a giant warning line that stretched from Hawaii, across Alaska, Canada, and Greenland to Iceland, and down the Atlantic seaboard. By 1958, the facilities in Alaska were an integral part of NORAD, with the Commander in Chief, Alaska (CINCAL), also serving as commander of the Alaskan NORAD Region.[18]

Impacts on Alaska

The Cold War defense establishment was the principal contributor to Alaska's infrastructure improvements from 1945 until oil development in the late 1970s, spurring tremendous growth in roads, airfields, and fuel delivery systems. Not only was the military behind the creation of nearly the entire Alaskan road system, but communications in Alaska also made huge leaps in reliability and accessibility as a result of the military's need to transmit vital information urgently and instantly. Military radar and navigation aides greatly improved civilian air transport.

Military research advanced arctic engineering. National interest in economic self-sufficiency, catalyzed by the Cold War, provided some of the impetus to explore for oil on Alaska's North Slope.[19] The ability to utilize the oil discovered derives in part from lessons learned building and maintaining Cold War defense systems in the Arctic. The experiences with the physical properties of permafrost and the physical demands of extreme wind chill on men and machinery in the 1950s helped companies extract oil at Prudhoe Bay and build the Trans-Alaska pipeline.[20]

During the Cold War, Alaska's civilian population nearly tripled, increasing from 139,000 in 1945 to 302,000 in 1970[21] and 553,000 in 1990. By 2010, the Alaskan population numbered 722,000.[22] The military population of Alaska averaged 20% of all Alaskans in the 1950s[23] but declined to 12% by the mid-1980s.[24] Historians Claus-M. Naske and Herman Slotnick attribute the decrease in military personnel to the increased sophistication of weapons systems.[25] Although troop numbers never approached their World War II height of 152,000, troop strength in Alaska during and after the Cold War never fell below 20,000.[26] Force strength in 2009 sat at 24,000 and the military comprised fewer than 5% of the total population.[27] In 1946, Alaska was a U.S. territory inhabited by a roughly even split of Natives and Whites.[28] By 1960, census figures indicate that the Native population had become a permanent minority.

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[17] Roberts, Sam. "In Archive, New Light on Evolution of Eisenhower Speech." *The New York Times*, 10 December 2010. http://www.nytimes.com/2010/12/11/us/politics/11eisenhower.html, accessed May 2012.
[18] Alaskan Command History, 1 July-31 December 1958. Elmendorf AFB, AK, 25.
[19] Hummel , 57.
[20] Hollinger, Kristy. *The Haines-Fairbanks Pipeline*. Fort Collins, CO: Center of Environmental Management of Military Lands, Colorado State University, 2003, 56.
[21] Hummel, 346–347.
[22] State of Alaska, Department of Labor and Workforce Development, Research Analysis. Annual Components of Population Change for Alaska, 1945–2011. http://labor.alaska.gov/research/pop/popest.htm, accessed June 2012.
[23] Rogers, *The Future of Alaska*, 95.
[24] DCS/Comptroller. *Impacts of Military Spending on the Economy of Alaska*. Elmendorf AFB, AK: DCS/Comptroller, Headquarters, Alaskan Air Command, 1984, 13.
[25] Naske, Claus-M., and Herman Slotnick. *Alaska: A History*. Norman, OK: University of Oklahoma Press, 1987, 138.
[26] Hummel , 346.
[27] Statewide Library Elecronic Doorway, Military in Alaska. http://sled.alaska.edu/akfaq/akmilit, accessed June 2012.
[28] United States Department of Commerce, Bureau of the Census. *Sixteenth Census of the United States: 1940. Population: Characteristics of the Population (with limited data on housing): Alaska*. Washington: United States Government Printing Office, 1943, 1.

The Cold War flood of people and money—the people in most instances drawn by the lure of defense jobs—helped the statehood movement dilute, then overcome, traditional sourdough sentiments and absentee business interests that opposed joining the Union. Political economist George W. Rogers wrote in 1962, "without the influx of new population and prosperity brought in by Military Alaska, it is doubtful that Alaska would today be a state."[29] Cold War immigrants to Alaska and the accompanying shift to a government-construction economy provided the "critical mass" that would achieve statehood for Alaska despite the reluctance of Eisenhower and elements of Congress.[30]

In monetary terms, Alaska's military buildup after 1946 was the largest economic activity until Prudhoe Bay oil fields started producing in 1977. After, military spending was still significant in Alaska's gross state product. The year after the end of the Cold War in 1991, the military contributed 8.2% to the total Alaskan workforce, five and one-half times the U.S. average. In several rural Alaskan communities, the economic effects of the Cold War were more pronounced. The 1990 U.S. Census figures for the Forward Operating Base communities of King Salmon and Galena show that the military was over half of the town's workforce. The Global War on Terror ensured that 20 years after the Cold War ended, military spending was still important in Alaska. More troops deployed overseas in 2009 than were even stationed at Fort Richardson in 2003.[31] The struggling U.S. economy following 2008 did promote austerity measures, however. USAF announced in spring 2012 that it planned to move an F-16 squadron from Eielson AFB to Elmendorf AFB, threatening 81 on-base jobs.[32]

In 1946, the military commenced construction and expansion of major defense facilities at Fort Richardson, Elmendorf AFB, Eielson AFB, Fort Greely, Kodiak Naval Air Station and Adak Naval Air Station.[33] Still today, twenty-plus years after the end of the Cold War, Eielson has the second-longest runway in North America. The 1950s witnessed the construction of the DEW Line and other radar installations, the White Alice Communications System and the Ballistic Missile Early Warning Site, and the maintenance of a large military force. The Cold War defense and research systems ensured four decades of prosperity for Alaska.[34] Alaska's permanent radar network cost hundreds of millions of dollars to build, operate and supply.

The economic impacts after 1946 contain some notable ironies. The Cold War buildup in Alaska resulted in a 25-year housing boom that existed side-by-side with a severe housing shortage. The defense construction resulted in the rapid proliferation of labor unrest and organized labor in Alaska, and the already high cost of labor soared as demand outstripped the supply of workers. Further, Alaska's natural resource-based economy, badly damaged during World War II, failed to rebound as workers followed the allure, not of gold or timber or salmon, but of federal jobs.[35]

The Coldest Front

The Alaska State Historic Preservation Officer received a grant from the Department of Defense's (DoD) Legacy program to write a historic overview of the state's Cold War properties. The study is to assist DoD

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[29] Rogers, 97.
[30] Cole, Terrence. *Fighting for the 49th Star: C.W. Snedden and the Crusade for Alaska Statehood*. Fairbanks, AK: University of Alaska Foundation, 2010, 41.
[31] Bluemink, Elizabeth. "Fort Rich Expands as Troops Go to War." *Anchorage Daily News*, 2 June 2009. http://www.adn.com/2009/06/02/817199/fort-rich-expands-as-troops-go.html#storylink=misearch, accessed June 2012.
[32] Friedman, Sam. "Interior Alaska leaders address Air Force over planned departure of Eielson's F-16s." *Fairbanks Daily News-Miner*, 1 June 2012. http://newsminer.com/view/full_story/18835463/article-Interior-Alaska-leaders-address-Air-Force-over-planned-departure-of-Eielson%E2%80%99s-F-16s?, accessed May 2012.
[33] Eielson Air Force Base Fact Sheet. http://www.eielson.af.mil/library/factsheets/factsheet_print.asp?fsID=18948&page=1, accessed May 2012.
[34] Kresge, David T., Thomas A. Morehouse, and George W. Rogers. *Issues in Alaska Development.* Seattle: University of Washington Press, 1977, 45.
[35] "The U.S. Military as Geographical Agent: The Case of Cold War Alaska." Geographical Review 95, no. 1 (Jan. 2005), 47–72, 55.

property managers with managing the numerous Cold War properties under their responsibility. This study shows that individual Cold War properties are interrelated parts of a larger unit. They often had major impacts on local areas.

This study does not contain all the parts that a historic context should have as outlined by the National Register of Historic Places. Historic context by definition is "an organizing structure for interpreting history that groups information about historic properties that share a common theme, common geographical area, and a common time period. The development of historic contexts is a foundation for decisions about the planning, identification, evaluation, registration, and treatment of historic properties, based upon comparative historic significance."[36] It consists of the history (relating time, place and theme), property types, and criteria for registration. A historic context provides direction for evaluation of properties. This study discusses only the history.

The study is organized in terms of the functional and technological aspects of Alaska's Cold War, not chronologically. "Detect and Monitor" addresses the major radar systems that operated in Alaska. "Communicate" discusses the White Alice system that passed on the warning of airborne intrusion. "Intercept and Respond" covers Nike Hercules batteries and forward operating interceptor bases. "Guard and Defend" focuses on the Army and Navy installations that protected Alaska from invasion and overflight. "Tomorrow's War" addresses the efforts to develop and apply advanced technology to both the Cold War "battlefield" and the home front.

America made a massive Cold War investment in Alaska, building numerous military bases and air defense systems. These installations were erected and operated in a land of extreme cold and vast distances. Alaska's sites are a significant—and yet largely unexplored—part of America's Cold War story. The fragile nature and current rate of destruction of Alaska's properties from this era makes expectations of their survival beyond the 50-year threshold doubtful.

Detect and Monitor

For millennia, opposing armies placed pickets as forward observers to watch for enemy movements and signs of an imminent attack. The nature of providing tactical warning of an enemy advance changed dramatically in the late 1930s with the advent of radar (radio detecting and ranging).[37] Radar made it possible to see enemy ships and aircraft long before the sharpest human eye could detect a speck on the horizon. First deployed in Britain against the German *Luftwaffe*, radar played an ever-increasing part in World War II.[38] During the Cold War, one of the most vital tools in each side's arsenal was the ability to detect enemy aircraft and, soon, intercontinental ballistic missiles. Without sophisticated, reliable detection capability, interception and neutralization of threats would be impossible.

In November 1947, the Joint Chiefs of Staff approved implementation of a report called the Radar Fence Plan, code named *SUPREMACY* by the new U.S. Air Force. *SUPREMACY* suggested that a comprehensive, technologically advanced radar net be established countrywide, with 37 stations in Alaska. The administration, concerned with defense cuts rather than appropriations, balked at the $600 million price tag.[39] The 1948 Berlin Crisis, however, caused the American public and its political leadership to reassess the proposal.

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[36] National Park Service. National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation. U.S. Department of the Interior, National Park Service, Interagency Resources Division, 1997, 53.
[37] Kirby, M., and R. Capey. "The Air Defense of Great Britain, 1920–1940: An Operational Research Perspective." *The Journal of the Operational Research Society* 48, no. 6 (June 1977), 555–568, 561.
[38] "How Radar Saved England." *The Science News-Letter* 48 no. 8, (25 August 1945), 117.
[39] Green, Tom. *Bright Boys: The Making of Information Technology*. London: A.K. Peters Ltd., 2010, 160.

In September 1949, President Truman announced that the Soviet Union had detonated an atomic device. The revelation stunned America's public, its government, and its military establishment. In October 1949, Congress approved funding for a scaled-down radar net in Alaska.[40] An April 1950 national security analysis document known as *NSC-68* recommended that DoD "provide an adequate defense against air attack on the United States." The air attack threat was the Tupolev TU-4 "Bull" bomber deployed to Siberia.[41]

An August 1951 defense study, Project Charles, prepared by MIT's Lincoln Laboratory recommended the immediate computerization of air defense systems. That same year, a huge vacuum tube Whirlwind I computer was tested for use as a Semi-Automatic Ground Environment System (SAGE) at Cambridge, Massachusetts.[42] SAGE would eventually link the Alaska-Canada radar systems, interceptor bases, and Nike batteries to NORAD/CONAD in Colorado.

The United States and the Soviet Union had active short and intermediate range missile development programs before the Cold War. After 1945, each country began long-range missile research. Both employed rocket scientists and equipment from the German World War II V-2 program.[43] By the late 1950s, accelerated efforts by the U.S. and the Soviets to develop nuclear and thermonuclear (hydrogen) weapons made smaller, lighter, missile-borne payloads possible.

Until the mid-1950s, American radar defense technologies were inadequate to either detect or intercept surface-to-surface strategic missiles. Even then, accelerated radar development programs were undertaken only after intelligence from U-2 spy plane overflights indicated that Soviet missile programs were progressing more rapidly than anticipated.[44]

The recognized bomber gap of the early 1950s lost its significance due to two significant events in 1957. First, the Soviet Union successfully tested an intercontinental ballistic missile, immediately rendering the entire American air defense structure obsolete. Moreover, on October 4, 1957, the Soviet Union launched and orbited *Sputnik I*, the world's first satellite. *Sputnik* represented a new component of the Cold War technology race– space warning and targeting systems. The United States, now fearing both a "missile gap" and Soviet satellite surveillance, moved rapidly to develop more sophisticated means of surveilling and detecting the enemy.[45]

One month after *Sputnik*'s launch, the U.S. Federal Office of Defense Mobilization released the sensational Gaither Committee Report. Employing considerable hype and questionable data on the Soviet Intercontinental

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[40] Winkler, David F. "Searching the Skies: The Legacy of the United States Cold War Defense Radar Program." United States Air Force Headquarters Air Combat Command, 1997.

[41] White, Ken. *World in Peril: The Origin, Mission and Scientific Findings of the 46th/72nd Reconnaissance Squadron*. Elkhart, Indiana: K.W. White and Associates, 1994, 40.

[42] Lemnios, William Z., and Alan A. Grometstein. "Overview of the Lincoln Laboratory Ballistic Missile Defense Program." *Lincoln Laboratory Journal* 13, no. 1 (2002), 12.

[43] The United States government conducted a secret program, Project Paperclip, for the purpose of recruiting German scientists to aid in the development of American military technology. The Soviets pursued a similar policy. Despite Soviet protests to the contrary, German scientists were credited with helping the Soviet Union develop the atomic bomb long before the United States felt should have been able. See Hunt, Linda. *Secret Agenda: The United States Government, Nazi Scientists, and Project Paperclip, 1945–1990*. New York: St. Martin's Press, 1991, and also Oleynikov, Pavel P. "German Scientists in the Soviet Atomic Project." *The Nonproliferation Review*, Summer 2000, 1–30.

[44] Schaffel, 255.

[45] Price, Kathy. *Tracking the Unthinkable: The Donnelly Flats MIDAS Ground Station and the Early Development of Space Warning Systems, 1959-1967, Fort Wainright Donnelly training Area, Alaska*. Fort Collins, CO: Center of Environmental Management of Military Lands, Colorado State University, 2006, 6-7.

Ballistic Missile (ICBM) program, the report emphasized the vulnerability of the U.S. to nuclear sneak attack over the polar regions.[46]

In response to this perceived vulnerability and as part of a theme of expanding national air defense, five radar systems were constructed in Alaska during the Cold War: the Aircraft Control and Warning System (1951-1968), the Distant Early Warning Line (1953–1969), the Ballistic Missile Early Warning System (1961-present), the Cobra Dane Radar Facility (1978-present), and the Relocatable Over the Horizon Radar System (1987–1993).

***Detect 1**

Aircraft Control and Warning, 1951–1968

At the end of World War II, radar coverage in Alaska was concentrated on the Alaska Peninsula and Aleutian Island chain, where it had been directed toward Japan.[47] By 1946, the Soviet Union supplanted Japan as America's principal foe, triggering a reassessment of continental defenses in Canada and Alaska. The U.S. Army Air Force moved its headquarters in Alaska from Adak to Elmendorf AFB near Anchorage, and, on January 1, 1947, the first postwar U.S. military unified command, the Alaska Command (ALCOM), was established.[48] Elmendorf, Ladd, King Salmon, Nome, and St. Lawrence Island were to get radar to detect bombers from bases in the Soviet Far East.[49]

Major General William Hoge, Deputy Commander of the U.S. Army Engineers, came to Alaska in 1946 to study the existing air defense system and suggest new radar defense requirements. The Hoge Board recommended 36 Aircraft Control and Warning (AC&W) radar sites in Alaska. An Alaska Air Command (AAC) study recommended 58 radar sites. An air defense study team headed by Lt. Col. H.J. Crumley devised a third, selected downsized scenario in 1947. This plan called for 13 strategically located Alaskan AC&W sites to supplement those established at Elmendorf, Ladd, King Salmon, Nome, and St. Lawrence Island.[50]

Focused around main interceptor bases established at Ladd and Elmendorf, building the AC&W network in Alaska began as part of the U.S. Permanent Radar System in the summer of 1950. With the outbreak of the Korean War that June, additional AC&W stations were constructed. Surveillance AC&W stations were sited to cover a broad area and placed at high elevations to assist line-of-sight radars. In all, five Alaskan sites were for coastal surveillance (the outer ring), five interior sites for ground-controlled intercept (GCI) (the inner ring), and master GCI radars at Ladd and Elmendorf.[51]

***AC&W 1**

The GCI air defense concept was based on air defense tactics conceived in the 1930s and first used by the Royal Air Force in the famous Battle of Britain.[52] Using high-frequency radio beams and forward observers on the

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[46] Snead, David Lindsay. *Eisenhower and the Gaither Report: The Influence of a Committee of Experts on National Security Policy in the Late 1950s*. Doctoral Dissertation: Richmond, VA: University of Virginia, 1997, 2.
[47] Denfeld, D. Colt. *The White Alice Communications System*. U.S. Army Corps of Engineers Alaska District, 2001, 1.
[48] ALCOM History, 1975, v.
[49] Cloe, John Haile. *Top Cover and Global Engagement: A History of the Eleventh Air Force*. Anchorage, AK: Alaska Quality Publishing, 2001, 13.
[50] Cloe, John Haile. *Top Cover for America*. Missoula, MT: Pictorial Histories for the Anchorage Chapter, Air Force Association, 1984, 160.
[51] Hummel, 63.
[52] "How Radar Saved England." *The Science News-Letter* 48, no. 8, 117.

ground, interceptor pilots could be vectored to the projected flight paths of airborne intruders.[53] Radar gave interceptor pilots and crews true advance warning. Increasingly advanced radar meant that warnings came earlier and with more precision, giving ground and air defenses time to respond.

The first Alaska AC&W station, Murphy Dome, started operating in 1951.[54] Cape Newenham, the last of the original sites, was operating by April 1954. The construction costs were nearly $50 million. Three years later, six sites were added, finishing the system with a station at Bethel in 1958.[55]

Aircraft Control and Warning Stations

(A) Active LRRS Radar
(D) Demolished
(E) Empty

Year	Place
1951	Murphy Dome (D)
	Fire Island (D)
	King Salmon (A)
1952	Tatalina (D)
	Campion (D)
1953	Cape Lisburne (A)
	Cape Romanzof (D)
	Tin City (A)
	Northeast Cape (D)
	Indian Mountain (D)
1954	Sparrevohn (D)
	Cape Newenham (D)
1958	Ohlson Mountain (D)
	Fort Yukon (D)
	Middleton Island (E)
	Unalakleet (D)
	Kotzebue (E)
	Bethel (D)

Building the AC&W stations was difficult and dangerous. It required overcoming the immense logistical burden of transporting supplies and equipment to remote sites, made particularly difficult by the need to site stations at high elevations to avoid radar signal impedance.[56] Construction was beset by difficulties such as severe weather, transportation delays, and labor unrest. These problems continued to challenge major defense construction in Alaska throughout the Cold War.

In 1951, the Alaskan Air Command employed the Military Sea Transport Service to bring six to nine months of supplies to the AC&W sites and Galena Forward Operating Base. Although fraught with problems, in 1952, the Army, Navy and Air Force participated in the supply effort. In 1953, the program became known as Mona Lisa and grew as new remote facilities opened. In 1966, the program was renamed Cool Barge.[57]

***AC&W 2**

Approximately half of the AC&W stations had buildings constructed at two separate sites due to the high altitude required for the radar to function properly. Radomes stood at the higher elevation. They housed the

[53] Winkler, *Searching the Skies*, 9.
[54] Cloe, 167.
[55] Cloe, 170.
[56] Hummel, 63.
[57] ALCOM History, 1967, 85.

radars and had overnight accommodations for personnel. At a lower site was a composite building that housed operations and personnel. Other buildings housed communications, living accommodations, and storage.[58]

***AC&W 3**

Changes in strategic command, reductions in the continental defense budgets, and advancements in radar technology led to closures and operational changes at AC&W sites as the Cold War progressed. By the 1970s, orbiting strategic reconnaissance satellites, such as the Defense Support Program, began to circumvent the need for tactical warning radars.[59] In 1974, the Saber Yukon report prescribed an overhaul of the AC&W system and recommended assignment of joint surveillance and control to the Federal Aviation Authority.[60]

While many of the AC&W sites have since been repurposed or demolished, King Salmon, Cape Lisburne, and Tin City AC&W stations received updated radar technology and were reassigned to NORAD's Long Range Radar System (LRRS). Known as the Seek Igloo Program, this $113 million technological change to AN/FPS-117 air defense radar was complete by the mid-1980s.[61] Indian Mountain, Sparrevohn, Cape Romanzof and Tatalina AC&W stations were demolished and replaced with LRRS stations featuring aluminum geodesic domes. Used only in Alaska, the innovative radomes and the radar they housed were part of a USAF program called Minimally Attended Radar (MAR). MAR facilities needed only a fraction of the personnel required to run a pre-1970 AC&W site.[62] The LRRS and MAR facilities remain in use today.

The Distant Early Warning Line,[63] 1953–1969

The Distant Early Warning (DEW) Line grew out of the same concerns that prompted the creation of the AC&W system. In an era when the Soviet Union was stationing ever more bombers in Siberia, American air defense experts judged America's anti-bomber warning systems to be completely inadequate. U.S. Air Force Chief of Staff Hoyt Vandenburg publicly admitted in the early 1950s that the generally accepted efficiency of air defenses was a nominal 30% of total intruders.[64] Aware that the image of waves of Russian aircraft carrying atomic bombs to targets in the American heartland would be unacceptable to the public, Vandenburg proposed an air defense called the Manhattan Project.

In April 1952, supplementing the earlier Project Charles report, a USAF air defense study known as East River revealed that civil defense measures alone would be nearly futile against atomic weapons delivered by a determined foe. East River concluded that Soviet weapons, and the aircraft that carried them, needed to be stopped before they reached the United States. The study claimed that U.S. air defense goals could be achieved using an electronic outer warning radar network "not less than 2,000 miles from the continental limits of the United States."[65] The significance of the 2,000-mile figure was time. Earlier detection meant faster intercepts and reduced the likelihood of a nuclear payload striking an American city. East River identified the Arctic coasts of Alaska and Canada as part of this radar net. Thus was born MIT's Summer Study Group, a collection

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[58] Hummel, 65.
[59] Price, *Tracking the Unthinkable*, 15.
[60] Denfeld, D. Colt. *The Cold War in Alaska: A Management Plan for Cultural Resources.* Anchorage, Alaska: U.S. Corps of Engineers, 1994, 123.
[61] Winkler, 95.
[62] Denfeld, 40.
[63] Hanscom AFB documented the Alaska DEW Line stations and the system was determined to be eligible for inclusion in the National Register of Historic Places in 1978. It was determined that the DEW Line has national significance in the areas of military, politics and government, invention, engineering, and communications.
[64] Schaffel, *The Emerging Shield*, 140.
[65] Jockel, Joseph T. *No Boundaries Upstairs: Canada, the United States and the Origins of North American Air Defense, 1945-1958.* Vancouver: University of British Columbia Press, 1987, 63.

of 40 civilian scientists and engineers, including the father of the atom bomb, Robert Oppenheimer. By September 1952, they had conceived the Distant Early Warning Line, a system capable of detecting Soviet bombers a full hour before their arrival over North America's population centers.[66]

The DEW Line was the most ambitious radar warning line in North America, but it was not the first. The Pinetree Line, principally financed and staffed by the United States, was constructed on the Canadian-American border. Consisting of 30 stations, it was up and functioning by 1954.[67] Next came the Mid-Canada Line. Also known as the McGill Fence, it was built along the 55th parallel, paid for and operated by Canadians.[68] The McGill Fence was not a true radar line, but an unmanned microwave Doppler Fence, subject to false alarms (formations of wild geese were detected). Rudimentary as it was, it provided the technological model later used to plug the gaps in the DEW Line.[69]

***DEW 1**

President Eisenhower approved construction of the DEW Line in 1954. Not only did the President aim to convince the Soviets that the United States would respond to any nuclear attack with "massive retaliation," he meant to further protect the United States from that very threat and convince the Soviets that any attack would be not only suicidal, but futile.[70] Known at the time as Project 572, the DEW Line was built (aside from the 1953 Barter Island prototype) in its entirety in a mere 32 months by 25,000 American and Canadian laborers and technicians directed by Western Electric Company.[71] Prefabricated station components were fitted together in Seattle or at Elmendorf AFB. These were disassembled, flown to the Barrow Camp staging area, reassembled, and attached in series, mounted on sleds, and transported by cat trains over routes marked by air-dropped flags to the sites.

Western Electric learned from the problems that beset the Barter Island prototype. The wind-swept arctic tundra fostered inventive engineering solutions for problems with the prefabricated buildings. At a site, the modules were aligned east-west to show the minimum profile to the strong westerly arctic winds. This alignment offered the least area for snowdrift eddies to form.

Placed directly on the frozen tundra, the Barter Island buildings radiated enough heat to melt the permafrost and make the module foundations uneven. Western Electric solved this problem by steam-drilling into the permafrost and inserting steel pilings into the holes. The ground refroze, and modules and radomes were hoisted atop the pilings, separating them from the permafrost. This also allowed wind-lashed snow to blow under the buildings relatively unimpeded.[72]

***DEW 2**

The danger of fire prompted the addition of a fire-barrier module to each station. Built into the train, one to every eight modules, the barrier had a metal roof and siding. It formed a firebreak that could be bulldozed out of the way if necessary.

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[66] Naka, F. Robert, and William W. Ward. "Distant Early Warning Line Radars: The Quest for Automatic Signal Detection." *Lincoln Laboratory Journal* 12, no. 2, 2000, 181–204, 181. La Fay, Howard. "DEW Line: Sentry of the Far North," in *National Geographic Magazine* (July 1958), 129–146, 129.
[67] Jockel, 44–46.
[68] Jockel, 79–85.
[69] Naka and Ward, 191–192.
[70] Jockel, 78.
[71] Western Electric Corporation, "The DEW Line Story in Brief." In Lackenbauer, P. Whitney, Matthew J. Farish and Jennifer Arthur-Lackenbauer. *The Distant Early Warning (DEW) Line: A Bibliography and Documentary Resource List*. Arctic Institute of North America, 2005, 9.
[72] Western Electric Corporation, 13.

As with the AC&W system, resupply of the DEW Line was an annual exercise in long-range logistics. Project 572 serviced the DEW Line annually, beginning in 1953. It delivered over 212,000 tons of building supplies to DEW Line sites from Shepard's Bay, Canada, to Point Lay, Alaska. Later, DEW Line supply merged with the AC&W system's program.

By the time the DEW Line stations were completed in spring 1957, they had consumed 46,000 tons of steel, 75,000,000 gallons of fuel, 22,000 tons of food, and 12 acres of bed sheets. They also cost the lives of 26 airmen and construction workers lost in 60 air crashes.[73]

On July 31, 1957, Western Electric Corporation turned the completed DEW Line over to the U.S. Air Force. The Air Force transferred nominal operational custody to Federal Electric, the service division of International Telephone and Telegraph (ITT). The world's longest single integrated radar system began operation, dedicated solely to defense of North America from aircraft intruding over the North Pole. The DEW Line stretched along the arctic coast of North America between Canada's Baffin Island and Alaska's Point Lay.

Of the 52 DEW Line stations, 16 were in arctic Alaska. There were main, auxiliary, and intermediate stations. Sector headquarters were at the main stations (POW-M, BAR-M). Auxiliary stations were at regular intervals in the 500 or so miles between main stations, and were designated by the next westerly main station's symbol, a dash, followed by the sequential number. Intermediate stations, or I-sites, equipped with Doppler type radar fences, were placed between the rotating radars of main and auxiliary stations where necessary.

Arctic DEW Line

	Code	Place
Main:	BAR-M	Barter Island
	POW-M	Point Barrow
Auxiliary:	POW-1	Lonely
	POW-2	Oliktok
	POW-3	Bullen Point
	LIZ-2	Wainwright
	LIZ-3	Point Lay
Intermediate[74]:	LIZ-A	Cape Sabine
	LIZ-B	Icy Cape
	LIZ-C	Peard Bay
	POW-A	Cape Simpson
	POW-B	Kogru River
	POW-C	McIntyre
	POW-D	Brownlow Point

***DEW 3**

[73] La Fay, 129–146. La Fay's article in *National Geographic* remains a leading source on the DEW Line, particularly its construction. Unless otherwise noted, figures given on the DEW Line are taken from his work.

[74] Camden Bay, Nuvagapak Island and Demarcation Bay were decommissioned in 1963 due to equipment upgrades to Main and Auxiliary stations. Thompson, Gail, and Werner, Robert. "DEW Line: The Alaska Segment." Determination of Eligibility for the National Register of Historic Places documentation, on file at the Office of History and Archaeology, Anchorage, Alaska, 1986, 25.

In 1965, the Air Force awarded Federal Electric the contract to operate the DEW Line. The handoff to Federal Electric marked a trend of employing civilian firms to operate important and sensitive military facilities with minimal military oversight.[75]

Information on potentially hostile, and even friendly, aircraft was sent laterally along the DEW Line to a main station, then to the Air Defense Combat Centers at Campion from POW-M, or Murphy Dome from BAR-M. From the centers, data was sent via the White Alice Communications System to the NORAD/CONAD Regional Combat Command Center (ROCC) at Elmendorf AFB and NORAD Command in Colorado.

The center of activity at auxiliary and main stations was the radar console. The surveillance room had the console, radarscopes, air and ground radio transmitters, fire alarm monitors, intra- and interstation telephones, and teletype facilities. Two radicians staffed the console 24 hours a day. One operated the console, and the other performed equipment maintenance. During each shift, console operators were to track targets as they appeared on the scopes, report targets to the controlling data center, provide aircraft with radar and weather advisories, and log equipment outages and significant actions. Other personnel were responsible for secondary areas at the DEW Line site, including the garage, POL, and kitchen.

Arctic DEW Line stations reflect their isolation and inaccessibility. The number of modules at a station was dictated by the type of station. A main station had two 25-module trains, an auxiliary station had a single 25-module train, and an intermediate station had five modules. All DEW Line stations had communication transmitter relay towers and gravel airstrips. The main and auxiliary stations had rotating radar housed in radomes that straddled the modular buildings.

The original radars were AN/FPS-19 line-of-sight search radars developed for the DEW Line by Raytheon Corporation. At a later date, ANJ/FPS-23 gap-filler radar was placed at the main and auxiliary stations to compensate for the AN/FPS-19's low altitude shortcomings. Intermediate stations had gap-filling electronic Doppler radar fence.

North Warning System

In 1985, the U.S. and Canada entered into the North American Air Defense Modernization Accord, Program 413L. They agreed on a $7 billion upgrade to the system, with approximately $1.1 billion allocated to retrofit the obsolete DEW Line. Construction began in 1988, with a projected completion date of 1992.[76] Computer systems, software, and communications upgrades were part of the improvement program. DEW Line stations at Barter Island, Oliktok, Point Barrow and Point Lay are components of Program 413L. Abandoned DEW Line stations at Bullen Point, Wainwright and Point Lonely were updated with unattended short-range radars and reactivated in 1994. Now known as the North Warning System of NORAD, the aircraft and missile warning system has 49 stations stretching from Point Lay in Alaska through Greenland. 15 stations are manned, and 34 short-range supplemental units are automated.[77] The Alaskan segment of the North Warning System, active since 1994, is known as the Alaska Radar System and comprises 16 long-range and 3 short-range facilities.[78] All Alaskan radars report data to the Regional Operations Control Center (ROCC) at Elmendorf AFB, part of the Canadian-American Joint Surveillance System (JSS). Canadian sites are under sole Canadian command and

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[75] A USAF officer who reported to the Commander of Detachment 1 commanded each station. Denfeld, *The Cold War in Alaska*, 27.
[76] Hancock, Lin. "DEW Line Updated: Electronic Sentinels Guard the North." *The Hour* (Norwalk, CT), 21 March 1991, 23. http://news.google.com/newspapers?id=oAYhAAAAIBAJ&sjid=gHYFAAAAIBAJ&pg=2966,2840333&dq=early-warning+radar-site+to-open&hl=en, accessed May 2012.
[77] Grant, Shelagh D. *Polar Imperative: A History of Arctic Sovereignty in North America*. Vancouver: D&M Publishers, 2010, 334.
[78] Piquniq Management Corporation (PMC), "The Alaska Radar System." http://www.alaska.net/~pmc/experience/radar.html. Accessed May 2012.

report to the Sector Operations Control Center (SOCC).[79] Each long-range site is staffed by seven contractor personnel, who operate long-range AN/FPS-117 Air Defense Radar. The short-range stations use AN/FPS-124 short-range radars.[80]

***DEW 4**

Aleutian DEW Line

An extension to the DEW Line was recommended by the Alaskan Command and authorized in 1957, with construction and testing again contracted to Western Electric Corporation.[81] Upon completion in 1959, the Aleutian DEW Line extended 630 miles along the Alaska Peninsula and the Aleutian Islands west to Umnak Island. The USAF built and activated six stations as part of the project, known as Operation Stretchout. The Aleutian DEW Line stations were combined with White Alice tropospheric communication stations and equipped with FPS-19 radar.[82]

A main station was built at Cold Bay and auxiliary stations at Port Heiden, Port Moller, Cape Sarichef, Driftwood Bay, and Nikolski. These radars were decommissioned on June 1, 1969, although the attendant White Alice communications facilities operated until November 1978.

Aleutian DEW Line

	Code	Place
Main:	COB-M	Cold Bay
Auxiliary:	COB-1	Nikolski
	COB-2	Driftwood Bay
	COB-3	Cape Sarichef
	COB-4	Port Moller
	COB-5	Port Heiden

The DEW Line was not merely a land-based warning net. The Atlantic side was anchored to radar picket ships, and Texas Tower radar platforms were placed 100 miles offshore on the northeast continental shelf. On the Pacific side, the Aleutian DEW Line was linked to radar picket ships out of Adak and Hawaii. These ships added 2,800 miles of surveillance and doubled the length of radar coverage. Out of Midway and Adak, EC-121 Warning Star airborne radar planes, the forerunner of today's Airborne Early Warning and Control System (AWACS) planes, supplemented the ships. Alaskan Air Command retained control over the Aleutian DEW Line until its deactivation in 1969.[83]

An Alaskan DEW Line station had a runway; building complex for housing, mess, operations, and power generation; radome(s); and communications towers. Aleutian DEW Line stations differed in form but not function from the Arctic stations. Aleutian DEW Line stations were two-story, reinforced concrete composite

[79] Bollinger, James E. "North Warning System (NWS)." http://www.radomes.org/museum/NorthWarningSystem.php. Accessed May 2012.
[80] Jane's Information Group. "Ground Radar/USA," in *Jane's Weapons Systems 1971-72, 1989-90*. Alexandria, VA: Jane's Information Group, 1971–72, 1989–90, 435.
[81] ALCOM History, 1 July-31 December 1958, 18.
[82] Winkler, 83.
[83] Cloe, 171.

buildings measuring approximately 162 feet by 179 feet. Additional Aleutian structures included Butler garages, runway, air terminal weather building, water pumphouse and two ammunition bunkers. [84]

Due to the endless pace of technological advance and changing operational needs, the DEW Line had become a dinosaur by the mid-1960s.[85] The advent of satellites and ICBMs rendered obsolete a network whose purpose was merely to detect enemy bombers. During the 1960s, the United States' overall Cold War strategy changed from one of "Massive Retaliation," in case of Soviet bomber strikes, to "Mutually Assured Destruction." Secretary of Defense Robert McNamara, addressing the House of Representatives defense appropriations subcommittee in January 1966, told congressmen that, "Today, with no defense against the major threat, Soviet ICBMs, our anti-bomber defenses alone would contribute very little to our damage limiting objective."[86] Fortunately, McNamara hinted, the U.S. had for several years been researching the means to detect and intercept ICBMs. A key element was the Ballistic Missile Early Warning System.

Ballistic Missile Early Warning System, 1961–Present

In 1953, concerned that the Soviets might be developing an intercontinental ballistic missile, the Air Force's Air Research and Development Command asked MIT's Lincoln Laboratory to study ICBM defense. Lincoln Laboratory prepared three studies, known collectively as Wizard 3. The recommendations of Wizard 3 led to the development of a system of three Ballistic Missile Early Warning Systems (BMEWS), spaced around the Arctic at large intervals.[87] Each BMEWS would have monstrous non-rotating radar antennas and communications gear to provide NORAD early warning of strategic missiles detected in its sector. The proposed system would be reliable in extremes of weather, incorporate electronic countermeasures, and discriminate between real and false alarms. Radar coverage above much of the Soviet land mass was achieved through the placement of BMEWS on or near the polar perimeter, spread over 2,600 miles.

***BMEWS 1**

Two months after the October 1957 launch of *Sputnik*, Secretary of Defense Neil McElroy directed the Air Force to continue research in early warning radar systems. The Air Force soon submitted General Operating Requirement (GOR) 156, calling for a practical Ballistic Missile Early Warning System (BMEWS) to provide radar coverage for North America.

The Department of Defense and Congress quickly approved GOR 156, and, in May 1959, Alaska Air Command's General C.F. "Nick" Necrason announced the imminent operational status of the BMEWS Site II at Clear. Located in a flat and open expanse 75 miles south of Fairbanks, BMEWS was designed to detect transpolar missile firings and bomber flights. The Clear complex complemented sister facilities at Thule, Greenland (BMEWS Site I) and Flyingdales Moor, England (BMEWS Site III).[88] Completed in 1961 and complemented with microwave and cable communications equipment, the $360 million BMEWS could give at least 15 minutes' warning to SAC bombers located in America's heartland.

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[84] Denfeld, *The Cold War in Alaska*, 70–71.
[85] Fritz, Stacy Anne. *The Role of Alaskan Missile Defense in Environmental Security*. Master's Thesis: Fairbanks, AK: University of Alaska Fairbanks, 2002, 33.
[86] Winkler, 37.
[87] Schaffel, *The Emerging Shield*, 256.
[88] A study performed by the Argonne National Laboratory for the 21st Space Wing, Air Force Space Command found Clear Air Station (BMEWS Site II) eligible for inclusion in the National Register of Historic Places. Clear Air Station "represents the only remaining intact site of the first system constructed for early warning of Soviet ICBM attack across the polar region (1958–1961). Hoffecker, John F., Mandy Whorton, and Casey R. Buechler. "Cold War Historic Properties of the 21st Space Wing, Air Force Space Command." Paper presented at the Cold War Workshop, Eglin Air Force Base, Florida, January 10–11, 1996.

***BMEWS 2**

BMEWS' purpose was radically different from that of the DEW Line. The early warning nets constructed across North America were intended to provide sufficiently early warning that American and Canadian forces could defend against *and* retaliate to Soviet bomber attacks. BMEWS addressed a new strategic reality. American defense forces simply could not intercept an ICBM, whether it was detected or not. However, the fifteen-minute window BMEWS granted would allow SAC to field its own nuclear arsenal and bring the same fate to the Soviets.[89] BMEWS, then, fully exemplified the giant bluffing game that was the Cold War. By showing the Soviets that the United States would be able to detect—and thus respond to—a nuclear attack, the U.S. might convince its foe that any nuclear attack would result in "Mutually Assured Destruction." Today, 20 years after the Cold War's end, the Clear BMEWS is part of the Air Force's Space Detection and Tracking System (SPADATS), along with the Cobra Dane installation on Shemya.[90]

The complex at Clear had three main areas: Tech Site, Composite Site, and Camp Site. The Tech Site consists consisted of the BMEWS radar and related buildings. The Composite Site consists consisted of support facilities such as dormitories, recreation facilities and warehouse and was connected to the Tech Site by an enclosed utility corridor. Base operations facilities that are not directly associated with BMEWS compose the Camp Site.

A large radome that housed the 25-meter parabolic tracking radar and three 400- x 165-foot static radar assemblies dominated the site. Each billboard reflector stood on 40 concrete piers. Each pier was 20 feet tall and contained 45 cubic yards of concrete and steel. Each pier rested on a foundation of 5,400 cubic yards of concrete and reinforced steel bars. The antennas were built to withstand earthquakes and winds of 180 miles per hour.

Fifteen hundred workers built the complex. A million yards of gravel and a mile of underground passageways were excavated to protect BMEWS personnel from atomic attack and the attendant radiation. Anti-radiation measures built into the passageways included nearly 700,000 square feet of copper screening and 25½ tons of solder to seal it in place. There was room for 600 people in one of BMEWS' two composite buildings.

There were two types of radar in use at Clear. The Army-Navy Fixed, Radar, Search (AN/FPS) AN/FPS-92 tracking radar was marginally different from the tracking radars at Flyingdales Moor and Thule. The main reception and transmission element to this radar was the 82-foot diameter parabolic reflector mounted on a conical pedestal. It rotated to track or search for a detected target continuously. The antenna was housed within a 141-foot diameter radome, consisting of two high-density, 1-millimeter thick skins that covered a 15-centimeter thick Kraft-paper core. The radome is made up of 1,646 hexagonal and pentagonal blocks. The AN/FPS 50 was a large static radar that used three tall parabolic reflectors fed by organ-pipe scanners. There were three of these large billboard antennas.

From the radar billboard antennas, two electronic beams fanned the atmosphere at differing angles. The radar pulse from objects passing through the beam closest to the horizon was fed to computers to determine position and velocity. Data from the second beam determined speed, trajectory, point and time of impact, and launch point. Data from Clear was then fed to NORAD's Semi-Automatic Ground Environment/back-up interceptor control (SAGE/buic) computer system, then to the NORAD Colorado Springs complex.

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[89] *Clear Air Force Station Ballistic Missile Early Warning Systems: History and Description*. September 2005.

[90] Jane's Information Group. "Space Detection and Tracking System (SPADATS))United States), Intelligence Systems—Surveillance and Reconnaissance. http://articles.janes.com/articles/Janes-C4I-Systems/SPAce-Detection-And-Tracking-System-SPADATS-United-States.html, accessed May 2012.

The Clear BMEWS facility has undergone technological modifications since operations began in 1961. Upgrades included replacing the older rotating radar with new phased array technology, the AN/FPS PAVE-Phased Array Warning System. PAVE is an Air Force program name relating to electronic systems, while PAWS stands for Phased Array Warning System (PAVE PAWS). New computers and software, increased bandwidth, larger raid tracking capability, and new ancillary communications connecting the site to NORAD have been installed. BMEWS Site II at Clear represents the only one of its type in the United States and, of the three built, has escaped substantial modifications from its original design. International Telephone and Telegraph (ITT) has operated and maintained the Clear BMEWS under contract with the USAF Space Command since 1987.

Solid State Phased Array Radar System (SSPARS)

Clear Air Force Station today is host to the Solid State Phased Array Radar System (SSPARS). Approximately 300 Air Force and civilian personnel operated the station, under command of the Alaska National Guard's 13th Space Warning Squadron. In conjunction with early warning satellites, BMEWS existed to warn of a ballistic missile attack. The Clear BMEWS supported the USAF Spacetrack[91] system, which fed in position and velocity data for the display of all earth-orbiting satellites to the Cheyenne Mountain Space Defense Operations Center (SPADOC).

The station also coordinates with American Aerospace Defense Command's Missile Correlation Center at Cheyenne Mountain. Space surveillance data is transmitted to the Strategic Command Joint Space Operations Center at Vandenberg Air Force Base.

The AN/FPS-123, Solid State Phased Array Radar System now operational at Clear is an older model, previously part of the PAVE PAWS program at El Dorado Air Station, Texas. The system came online in 2001 and is currently operational, with substantial upgrades envisioned.[92] The radar housing is a distinctive triangular structure with 11 stories and two radiating faces, each featuring 1,792 active elements.
The radar system has two faces that cover a 240-degree-wide, 3,000-mile-deep sector of atmosphere and space, bounded by the Arctic Ocean, the Pacific Ocean, and the west coast of the U.S. SSPARS is linked to the PAVE PAWS facilities at Cape Cod Air Force Station, Massachusetts, and Beale Air Force Base, California, the Perimeter Acquisition Radar Characterization System radar site at Cavalier Air Force Station, North Dakota, and the BMEWS radar sites at Thule and R.A.F. Flyingdales.

***BMEWS 3**

SSPARS also has a nonmilitary function. The same capability that allows detection of possible enemy satellites

[91] Spacetrack, of which the above mentioned SPADATS is a component, "is an Air Force system that was deployed in the 1960s. It consists of large radars and optical devices positioned globally to monitor objects in Earth orbit. Because satellites play an important role in tracking maritime activities and relaying Naval communications, the Navy established its own space tracking system. The Naval Space Surveillance System consists of a detection fence of nine stations positioned across the southern portion of the United States. The central transmitting station is located at Lake Kickapoo, Texas, with smaller transmitters located at Gila River, Arizona and Lake Jordan in Atlanta, Georgia. Receiving stations were built at San Diego, California, Elephant Butte, New Mexico, Red River, Arkansas, Silver Lake, Missouri, and Hawkinsville and Fort Stewart, Georgia. Data from these stations, along with inputs from Air Force sensors, is sent to Naval Space Surveillance (NAVSPASUR) Headquarters at Dahlgren, Virginia." From Winkler, David F. "Searching the Skies: The Legacy of the United States Cold War Defense Radar Program," 50.
[92] Capps, Kris. "Clear Air Force Station Turns 50." *Fairbanks Daily News-Miner*, 8 August 2011. http://www.newsminer.com/view/full_story/14982917/article-Clear-Air-Force-Station-turns-50. Accessed 4 May 2012.

and nuclear launches can also accurately catalog more than 16,000 objects in orbit. Such information helps manned spacecraft monitor objects entering the atmosphere and avoid harm.[93]

Cobra Dane Radar Facility, 1978 –Present

The Cobra Dane radar facility is located on Shemya Island at the western end of the Aleutian chain, closer to Russia's Kamchatka Pensinsula than to the Alaska Peninsula. Shemya was referred to by one military historian as "one of the most militarized islands in the world." The 5.9-square-mile island has served a variety of roles since World War II, from commercial stopover to advance base for intercepting Soviet aircraft. Its most consistent mission since the 1970s has been detection and intelligence gathering.[94] The Cobra Dane facility was emplaced in the 1970s, as the United States and the Soviet Union entered détente, a period of relative cordiality with the Soviets. While increasing diplomacy and attempts to agree on arms-reduction strategies characterized détente, the United States continued to pursue missile defense strategies and technologies. The U.S. appeared to be winning the space race at the same time it was pulling out of Vietnam.[95]

In the 1960s and 1970s, the Soviets used the North Pacific Ocean and the Kamchatka Peninsula for ICBM tests. Shemya's static radars were used by the USAF's Spacetrack system, designed to track orbital satellite traffic as well as monitor missile testing. However, the Air Force needed a better measure of Soviet activities than Shemya's radars could provide.

In the early 1960s, physicists developed phased array radar. Using computers and solid-state circuitry, phased-array radar allowed scanning without rotating or rocking antennas. Employing many small electronic sensors operating much like the compound eye of an insect, a phased array radar fed individual electrical impulses in precise computer controlled patterns. Unlike static radar, this technology used extremely short wavelengths to detect many small objects at once, even those moving very quickly through the atmosphere or in orbit.[96]

Congress authorized construction of the phased array Cobra Dane radar at Shemya in 1971, and work began in 1973. Four years and $68 million later, Cobra Dane was operational. Its AN/FPS-85 radar and AN/FPS-46 passive optical and radiometric sensors could track up to one hundred objects simultaneously with precise three-dimensional data on as many as 20 targets. Similar phased array radar on ships (Cobra Judy) and aircraft (Cobra Ball) supplemented Cobra Dane. Cobra Dane surveyed a 2,000-mile, 120-degree corridor to collect data. Information from Cobra Dane is fed to (SPADOC).[97]

The Cobra Dane facility is a single, multi-story steel frame building. The building's western elevation is canted 20 degrees and provides the backdrop to which a 96-foot diameter, nearly circular phased array radar assembly is attached. More than 34,700 individual radiating elements (antennas) comprise the array. Each antenna is housed within a 5-inch diameter, 12-inch-long plastic cylinder, affixed to ping-pong-sized steel plates that are attached to the radar face. Only 16,000 radiating elements are active. The others are dummies for spacing. The radar is electronically steered.[98]

Cobra Dane and the Ballistic Missile Defense System (BMDS)

[93] Fact Sheet, 13th Space Warning Squadron. http://www.peterson.af.mil/library/factsheets/factsheet_print.asp?fsID=4714&page=1. Accessed May 2012.
[94] Hummel, *Alaska's Militarized Landscape*, 82.
[95] Schwartz, Richard Alan. *The Cold War Reference Guide*. Jefferson, NC: McFarland, 1997, 104–107.
[96] Ruhl, Robert K. "In the Day of the Dane." In *Airman Magazine* (June 1977), 41–48.
[97] Jane's Information Group. "Ground Radar/USA," 56, 276.
[98] Klass, Phillip J. "USAF Tracking Radar Details Disclosed," in *Aviation Week & Space Technology* (25 October 1976), 41.

As of 2012, the Cobra Dane radar system is operational and newly upgraded to a fully modern missile detection array. Just as Shemya served as an advance base during World War II for operations against Japan and during the Cold War for intercepting Soviet aircraft, the island now has missile defense as part of its mission. Cobra Dane is part of a larger program known as Ground-based Midcourse Defense. GMD is part of the United States' Ballistic Missile Defense System, a layered defense net comprised of multiple different sensor technologies and sites designed to detect and intercept incoming missiles. Missiles, however, are not Cobra Dane's only objects of interest. Like BMEWS, Cobra Dane is also a component of USAF's Space Detection and Tracking System, a worldwide defense initiative meant to detect, identify, and track all objects in space.[99]

The Cobra Dane upgrade at Shemya had been planned at least as early as 2004.[100] According to the Missile Defense Agency, the upgraded radar can provide acquisition, tracking, object classification and other data to aid deployment of defensive surface-launched missiles. The missions of legacy intelligence and space tracking are unchanged, although responsibility for operation and maintenance has transitioned from the Missile Defense Agency to the U.S. Air Force.

***Cobra 1**

The upgraded Cobra Dane system has one 95-foot-diameter, 120-foot-high radar face with 136° of azimuth coverage. The array operates in the L-band frequency and is capable of detecting objects as far away as 3,000 miles.[101] Command and control comes from the 49th Missile Defense Battalion at Fort Greely, Alaska, and the 100th Missile Defense Brigade at Colorado Springs. Threats identified by the Cobra Dane array at Shemya or one of its fellow arrays would be destroyed by missiles deployed at Fort Greely and Vandenberg AFB. At the edge of Earth's atmosphere, the missile would deploy an Exo-atmospheric Kill Vehicle (EKV). The EKV would use kinetic energy to intercept and destroy the incoming ballistic missile in space before it re-entered the atmosphere.[102]

Missile Defense Alarm System (MIDAS), 1959–1967

The Missile Defense Alarm System, a creation of the late 1950s American political climate, reflects the United States' preoccupation with the threat of intercontinental ballistic missiles and its determination to meet the threat. The rest of Alaska's defense systems were ground-based and focused on stopping—or retaliating to—Soviet bomber attacks. MIDAS was the first space-based missile threat detection system and was the forerunner of America's defense support program satellite network and space warning system.

MIDAS evolved in the early years of the space race, that period when the USSR had launched first an ICBM and, shortly thereafter, the world's first satellite, *Sputnik I*. That single ICBM launch had rendered the entire American defense network a dinosaur. Not only could a missile not be recalled, it only took approximately 30 minutes for an ICBM to launch, exit and reenter the atmosphere, and strike its target anywhere in the world. MIDAS was a product of two factors. First, American strategists felt it imperative to discover the enemy's technological progress and be able to monitor Soviet development along with weapons launches. Second, aerial reconnaissance was rendered politically unviable when the Soviets shot down a U-2 spy plane in 1960 and

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[99] Jane's, "SPADATS."
[100] United States General Accounting Office. Report to the Ranking Minority Member, Subcommittee on Financial Management, the Budget, and International Security, Committee on Governmental Affairs, U.S. Senate. "Missile Defense: Additional Knowledge Needed in Developing System for Intercepting Long-Range Missiles." Report GAO-A3-600, August 2003. http://www.gao.gov/products/GAO-03-600. Accessed May 2012.
[101] Fact Sheet, Cobra Dane Upgrade. Fort Belvoir, VA: Missile Defense Agency, March 2011. http://www.mda.mil/global/documents/pdf/cobradane.pdf, accessed May 2012.
[102] US Department of Defense Missile Defense Agency, "Elements: Ground-based Midcourse Defense." 23 March 2012, http://www.mda.mil/system/gmd.html. Accessed May 2012.

captured its pilot, Gary Powers, after President Eisenhower had publicly denied American overflights of Soviet space.

The Alaskan MIDAS component was, along with its fellows, a part of the Air Force Satellite and Control Network, a collection of ground stations built to support the Air Force's early satellite programs. MIDAS needed three ground stations, or "operational readout stations," in Britain, Greenland, and at Donnelly Flats, Alaska, with the latter designated the North Pacific station, 12 miles south of Delta Junction. Donnelly Flats' activation cycle illustrates how quickly technology and priorities shifted. The installation was opened in 1961, closed in 1963, reopened in 1966, and closed permanently in 1967. All the USAF satellite ground stations tied into the command and control center at Sunnyvale. Initially operated by Lockheed, the site was gradually taken over by USAF, though civilian contractors were always involved. AFSCN used 12 ground stations for satellite support. The three in Alaska were Donnelly Flats (1961–1967), Annette Island (1959–1963), and Chiniak, Kodiak Island (1959–1975). The whole network coordinated MIDAS, CORONA, and SAMOS—the three WS-117L systems.

The MIDAS system was developed under the umbrella program Weapon System 117L, or the Advanced Reconnaissance System. Planned as early as 1954, WS117L featured CORONA (Discoverer) photo reconnaissance and film capsule recovery, MIDAS (Subsystem G) missile warning and infrared detection, and SAMOS (Sentry) visual reconnaissance. The three programs were initially disguised as civilian space research. They were meant to bridge the gap between U.S. and Soviet space technology and provide America early warning and reconnaissance capability. The project was put out for bid in 1955, with Lockheed assuming the contract in 1956. Real progress was not achieved until *Sputnik*'s launch in October 1957.

CORONA (Discoverer), 1959–1972

CORONA was a project designed to photograph Soviet off-limits areas. Satellites would take photos, drop film capsules into the atmosphere over the Pacific Ocean, and the capsules would be retrieved by the U.S. military in midair. Initially billed as a civilian space condition tracking project, CORONA was called Discoverer until 1962. It operated under near-total secrecy, completing 121 missions. The Air Force constructed a tracking station at Chiniak, on Kodiak Island, to track the satellite's position and send re-entry commands to ensure the film capsules would arrive in the correct area. The Chiniak station, really a never-activated AC&W station, had a 100-line telephone trunk and communicated via microwave and multiplexer with the nearby White Alice station at Pillar Mountain. Chiniak supported CORONA from 1959to 1972 and closed in 1975.[103] As of 2000, the site had been demolished and remediated under the Army Corps of Engineers Formerly Used Defense Sites Cleanup Program.[104]

MIDAS, 1959–1967

MIDAS required a number of polar-orbiting satellites. The polar orbit was preferred to an equatorial orbit. A satellite in an inclined polar orbit would view only a small slice of the world beneath, but each pass would reveal a new slice and ultimately the entire earth. An equatorial satellite would see the same view each time. Orbiting at 2,200 miles, using infrared sensing, the satellites could detect and track a missile's heat plume. Potentially hostile launches would be identified and the data transmitted via White Alice to NORAD, giving a full 15 minutes' edge (half the missile's flight time) over ground-based forms of ICBM tracking such as BMEWS.[105] As the satellite crossed the horizon, a ground tracking station would acquire (locate) it, observe its ephemerides (position, speed and trajectory), calculate the satellite's next position, and hand it off to the next

[103] Price, *Tracking the Unthinkable*, 10–11.
[104] Hummel, *Alaska's Militarized Landscape*, 264.
[105] Price, 12.

station—all in approximately 6 seconds.[106] The system was far more complex than CORONA, relying as it did on real-time telemetry of ICBM launches rather than simple still-photo surveillance. Thus, the system's reliability needed to be as near 100% as possible.

MIDAS needed to be able to reliably detect launches instantly, screen out background thermal radiation, like volcanoes, that might provide false alarms, and finally, communicate the warning to a ground station. The infrared technology was by far the weakest link, as it was not yet capable of such clear differentiation. Such a critical flaw characterized the entire MIDAS project. It was an endeavor so cutting edge that no baselines had been set for many of the measurements.[107] While the satellite telemetry was at best a work in progress, ground communications were excellent. Donnelly Flats featured capacity for 200 telephones, along with a 100-word-per-minute teletype and a 1200 bit-per-second duplex datalink, all of which could directly commune with headquarters at Sunnyvale, California.

***MIDAS 1**

MIDAS was designed to complement the ground-based BMEWS system, hence North Pacific Station's location in Interior Alaska. The Donnelly Flats site was remote enough to enjoy a clear signal for satellite telemetry and yet only 100 air miles from the BMEWS at Clear. The other stations around the circumpolar North were also co-located (or nearly enough) with their BMEWS counterparts. The Donnelly Flats site also took advantage of a BMEWS Rearward Communications site built on Donnelly Ridge, providing access to NORAD. The facility was constructed in 1959, with the contracts awarded to Chris Berg, Inc., and Peter Kiewit Sons, both of Seattle. The project was briefly impacted by a nationwide steel manufacturing strike but was nonetheless designated Operating Location 3 in March 1961. Infrastructure alone cost $5.48 million.[108]

***MIDAS 2**

North Pacific station had an administration building and a barracks on Fort Greely, and the receiver site at Donnelly Flats. The receiver site was a T-shaped complex of eight buildings, including an administration and data acquisition building, three receiver buildings with attached radomes, an angle tracker building, a power plant, heated vehicle storage, and a gatehouse. Three boresight towers framed the site, with one north of Receiver 2, and two near the angle tracker building. The site drew its distinctive appearance from the three receiver buildings and their 110-foot white radomes, each meant to enclose a 60-foot antenna dish. Only Receiver Building No. 2 was ever used as its designers intended. Limited funds precluded full use of the complex. Today, only the 119 x 93-foot power plant and the concrete bases for the radomes remind passersby that an out-of-the-way corner of Alaska was prepared to detect the onslaught of World War III.

Due to the intense pressure to outmaneuver the USSR, MIDAS was rushed into production. It suffered significant teething problems, among them limited infrared technology, telemetry inadequacies, and launch failures. Nine MIDAS satellites were launched between 1960 and 1963. The system was prone to failure, but no more so than other concurrent projects. CORONA's "Discovery" phase failed 12 times in a row before it functioned as intended. Still, MIDAS cost such a large amount of money and was so difficult technologically that Congress and the Department of Defense were reluctant to lavish it with the same funds bestowed on other aspects of the space program. The death knell for MIDAS as an actual missile detection system came as early as 1962, when Secretary of Defense Robert McNamara changed MIDAS' mission to research and development. After the 1963 launches, it would merely serve as a test mule for ideas and improvements. 1966 saw the Air Force already planning what would become known as the Defense Support Program, a next-generation missile

[106] Price 18.
[107] Price, 13.
[108] Price, 30–33.

defense alarm system focusing on geostationary orbits rather than MIDAS' low polar orbit approach.[109] Yet, as the multiple systems outlined in this document suggest, ballistic missile technology is far ahead of the means to defend against it.[110]

***MIDAS 3**

Relocatable Over-the-Horizon Radar (ROTHR), 1987–1993

The Air Force was not the only Alaskan service to invest in an early warning radar program. In 1987, seeking to improve its mission capability while reducing the number of maritime patrols, the U.S. Navy constructed a prototype Relocatable Over-the-Horizon Radar (ROTHR) system on Amchitka Island in the Aleutian chain. Completed in 1988, the ROTHR was designed to monitor aircraft and ships in the northwest Pacific Ocean.[111] A second Amchitka ROTHR came online in 1991 and was used until 1993. Two other ROTHR installations were built, one in England and another in Virginia. A site at Tinian in the Marianas Islands was proposed but never built. The whole operation was a test bed to determine the concept's effectiveness. The project has since migrated to the Caribbean, where it is used to assist in monitoring drug traffic.[112] The Amchitka facility was closed in 1993 and subsequently dismantled.[113]

*** ROTHR 1**

ROTHR was built by the Raytheon Company and tested at Norfolk, Virginia, before being shipped to Amchitka. When operational, ROTHR could detect Soviet ships and aircraft up to 1,500 miles away. The technology was not new, but the Navy's system was unique in that it was, as its name suggests, mobile. As the tactical situation evolved, the Navy could shift its detection net to cover areas of interest rather than building more facilities. The system worked by projecting a 35-foot-long radio wave into the ionosphere 500 miles distant. The long radio wave would bounce off the ionosphere, adding another 1,000 miles to the range and allowing detection and monitoring of objects far over the horizon. Operators could search one degree-arc (half the total area) at a time and pinpoint areas within the arc for greater detail.[114] All aircraft in the area would register on the radar, as would ships longer than 100 feet. The system's performance was unaffected by weather or terrain.[115] Ultimately, however, the system was so large and complex that its mobility was of limited practicality.[116]

***ROTHR 2**

The ROTHR site at Amchitka had an operations control center, a transmit site, and a receiver site. The transmit and receiver sites were separated by 50 to 100 miles, and each complete ROTHR unit included 42 transmitter power amplifiers in 10 shelters, with approximately 400 receivers in another 13 shelters. Each transmitter array was over 1,000 feet wide and 125 feet tall. A receiver array was made up of 372 pairs of 19-foot poles covering

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[109] Price, 13–15.
[110] The Department of Defense publication *Soviet Military Power: An Assessment of the Threat, 1988* (Washington, DC: US Government Printing Office), 105, released at the technological peak of the Cold War, notes that "ballistic missile technology is relatively mature, being understood well and applied by both the Soviet Union and the United States. Conversely, advanced technologies for ballistic missile defense are relatively immature."
[111] Department of the Navy, Naval Space Command. *Final Environmental Impact Statement: Second Relocatable-Over-the-Horizon Radar (ROTHR) System, Amchitka Island, Alaska*, III.
[112] "Relocatable Over-the-Horizon Radar (ROTHR) for Homeland Security." Tewkesbury, MA: The Raytheon Company, May 2004. http://www.raytheon.com/capabilities/products/stellent/groups/public/documents/legacy_site/cms01_049201.pdf, accessed June 2012.
[113] Denfeld, *The Cold War in Alaska*, 214.
[114] Denfeld, 213–214.
[115] Raytheon.
[116] *Navy Times*, 8 February 1988.

two miles. Incoming data would arrive at the receiver site and then be transmitted to the operations center by fiber-optic cable. Following analysis at the operations center, the information would be transmitted to naval vessels.

Over the Horizon Backscatter (OTH-B) Radar, 1988

The Over the Horizon Backscatter Radar (OTH-B) never actually materialized in Alaska. It is proof of the realities of defense funding and the nature of shifting tactical and strategic approaches. The Air Force in the 1970s and '80s conceived a next-generation radar program called Over the Horizon Backscatter Radar. The goal was long-range monitoring of all altitudes in airspace approaching the United States. Like ROTHR, the system would employ ionospheric refraction to monitor over-the-horizon sectors up to 1,800 miles out. The original conception featured four OTH-B sectors: East Coast, West Coast, Central (south-facing) and Alaska. The Alaskan OTH-B would be linked to the North Warning System DEW Line upgrade. Just as the system was coming online, the Cold War ended, prompting the Air Force to immediately place the entire West Coast system in caretaker status. The Alaskan and Central sectors were cancelled. The East Coast system (in another similarity to the Navy's ROTHR) was deployed for the remainder of its life in counter-narcotics operations in the Caribbean. The entire OTH-B system was closed in 1997 due to high operating costs and obsolete technology.[117]

***OTH-B 1**

In 1988, while the project was still funded, USAF authorized construction of a massive facility to house the system in Alaska. The OTH-B main transmitting station would be just north of Gakona, with a smaller receiving station near Tok. While the military embarked on a major construction enterprise and built access roads and a new coal power plant at Gakona to support the OTH-B site, OTH-B never occupied its new home.[118] The Tok station never made it past the planning stage. Neither did the operations center. The aborted OTH-B facility now serves in a different capacity than its planners envisioned. The Air Force repurposed Gakona for an experimental communications venture called HAARP, for High Frequency Active Auroral Research Program. HAARP, which also incorporates a civilian physics research component overseen by the University of Alaska,[119] is designed to transmit through the ionosphere (rather than bouncing off it, as ROTHR does). The ultimate goal is to communicate with a low-powered receiver anywhere in the world.[120]

***OTH-B 2**

Communicate

Communications was a significant part of the military mission in Alaska for over a century. Even before the United States purchased Alaska from Russia, the Western Union Telegraph Extension project had ambitiously pledged to connect Siberia, Russian America and British Columbia via telegraph.[121] The project was thwarted by the laying of the trans-Atlantic submarine cable. But the subsequent purchase of Russian America by the United States, and the military's key role in developing the territory, meant that communications between

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[117] Fact Sheet, "Over the Horizon Backscatter Radar: East and West." Air Combat Command, March 2008. http://www.acc.af.mil/library/factsheets/factsheet.asp?id=3863. Accessed May 2012.
[118] Denfeld, *The Cold War in Alaska*, 214.
[119] "HAARP: A Premier Facility for the Study of Ionospheric Physics and Radio Science." http://www.haarp.alaska.edu/. Accessed May 2012.
[120] Denfeld, *The Cold War in Alaska*, 215.
[121] Naske, Claus-M., and Herman Slotnick. *Alaska: A History*. Norman, OK: University of Oklahoma Press, 2011, 90–91.

Alaskan outposts and the continental United States would be important—an importance that peaked in the Cold War.

The U.S. Army built the Washington-Alaska Military Cable and Telegraph System (WAMCATS) at the turn of the century. Begun in 1900 and completed in 1903 with great difficulty, the network connected Alaskan Army posts with the continental United States, using a combination of telegraph lines and underwater cables.[122] General Adolphus W. Greely oversaw the construction project. A substantial segment (from Fairbanks to Eagle) was completed under the command of the man who became the prophet of the "polar concept," then-Lieutenant William "Billy" Mitchell.[123] Although built by the military, the Congressional act that authorized the telegraph's construction directed that the Army make the telegraph accessible to civilians whenever possible.[124] By the 1920s, wireless communications via naval radio stations began to replace the telegraph.

WAMCATS was renamed the Alaska Communications System (ACS) in 1936 and gradually grew into a telephone system. Its traffic was approximately 3% military, 33% government, 67% civilian.[125] The ACS coordinated air operations and warned of enemy attack following the Japanese raid on Pearl Harbor. The Korean War spurred modernization and expansion of the system at a cost of $10 million, but the Cold War stretched the ACS' capabilities beyond its limits.[126] While the Air Force maintained the ACS ostensibly for military usage, it had responsibility for the operation of civilian long-line communications and the Alaska Railroad's network.[127] ACS' days as the primary means of communications within Alaska and to the outside world were numbered, thanks to needs imposed by the Cold War.

The multitasking ACS was ill equipped to handle the high-volume, secure communications which the continent-spanning, high-tech air defense network of the 1950s required. The remoteness of the radar stations, the accelerated urgency of their message, and the frequency and power of auroral disturbances (northern lights) demanded a better, faster and more reliable system of communications between Alaska's military installations, its defense systems, and the command and control facilities in the continental United States.[128]

Very High Frequency (VHF) radio seemed initially promising to solve Alaskan Air Command's constant communications headaches and led the Air Force to build a prototype VHF system in early 1953. The experiment was a disaster. Atmospheric interference was reduced but not eliminated. Capacity was too limited. Active AC&W radar jammed VHF signals, rendering communication and radar operations difficult and often impossible. The military's frustration with these co-technologies led to the formation of the Alaska Communication Study Group, which reported to the Secretary of Defense in May 1954.

The military required a communications net that would span Alaska's vast distances and operate dependably in the storms, long winters, and extreme cold and wind characteristic of arctic and subarctic latitudes. It had to function continuously through auroral disturbances. It had to carry voice, telex, and data transmissions simultaneously. American Telephone and Telegraph (AT&T), tasked with developing the new system, proposed a network of tropospheric scatter and line-of-sight microwave sites. Microwave was also considered. However, its line-of-sight nature would have required a tremendous number of stations. It would only be used to supplement other arrays. "Tropo," by contrast, used extremely powerful transmitters to send radio signals

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[122] Naske, Claus-M. *The Board of Road Commissioners for Alaska, 1905 to 1917*. Anchorage, AK: Alaska Department of Transportation and Public Facilities, December 1980, 11.
[123] Burr Neely Jr., Ronald A. *Early Transportation Routes Fort Wainwright, Alaska*. Fort Collins, CO: Center of Environmental Management of Military Lands, Colorado State University, 2003, 12.
[124] Kursh, Harry. *This is Alaska*. Englewood Cliffs, NJ: Prentice Hall, 1961.
[125] Colby, Merle. *A Guide to Alaska: Last American Frontier*. New York: MacMillan, 1941, 99.
[126] Pamphlet 360-5, *Building Alaska With the U.S. Army, 1867–1965*. Headquarters, U.S. Army, Alaska, 1 October 1965, 98–99.
[127] Hummel, "US Military as Geographical Agent," 62.
[128] Cloe, *Top Cover for America*, 171.

into the troposphere, where most of the signal was lost but a small amount reflected to the receiver station. The receiver station either sorted signals for quality or, if necessary, combined two or three weak signals into one usable signal. Signals were sent in two formats on two frequencies. Of the four independent signals, at least one would be received at the other end.[129] Such redundancy was designed to improve system reliability.

White Alice Communications System,[130] 1957–1974

Between 1955 and 1957, Western Electric Company (WECO) built 20 White Alice (WACS) stations, and the Army Corps of Engineers built 11. WECO assembled the electronic equipment. The stations were sited to facilitate communications for the AC&W and DEW Line stations and to provide teleprinter and digital communications for Alaska's military commanders. Twenty-two of the stations were tropos, three combined tropographic scatter and microwave (TD-2) technologies, and six stations were microwave configuration only.[131]

Original White Alice Sites

(A) Active
(D) Demolished
(E) Empty/Abandoned
(R) Repurposed

Tropo		Micro	Tropo/Micro
Aniak (R)	Kotzebue (E)	Clam Gulch (R)	Neklasson Lake (R)
Anvil Mt. (E)	Cape Lisburne (D)	Naptowne (R)	Diamond Ridge (R)
Bear Creek (E)	Middleton Island (E)	Rabbit Creek (R)	Pedro Dome (R)
Bethel (D)	Cape Newenham (D)	R1-N (A)	
Big Mt. (D)	North River (D)	Soldotna (A)	
Boswell Bay (D)	Northeast Cape (D)	Starisky Creek (R)	
Fort Yukon (D)	Pillar Mt. (D)		
Granite Mt. (D)	Cape Romanzof (D)		
Indian Mt. (D)	Sparrevohn (D)		
Kalakaket Cr. (D)	Tatalina (D)		
King Salmon (E)	Tin City (D)		

Initially estimated to cost $38 million to build, the White Alice network ran up a construction bill of over $140 million.[132] By 1958, however, a state-of-the-art communications network linked the Alaska AC&W and DEW Line systems with Alaskan interceptor squadrons at Campion (Galena), Elmendorf and Eielson AFBs, as well as NORAD. The old system that allowed only one telephone call at a time from Fairbanks to Nome had been completely transformed.[133]

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[129] Denfeld, *White Alice*, 5–6.
[130] The Corps of Engineers prepared documentation for a determination of eligibility for the National Register of Historic Places for the White Alice Communication System in 1988. It has been determined that the system's significance is on the national level in the areas of communications and military.
[131] Denfeld, 7.
[132] Baker, Raymond T. *A Special Study of the Sale of the White Alice Communication System*. Elmendorf AFB, AK: 1931st Communications Wing, Office of Air Force History, 1987, 229.
[133] Mighetto, Lisa, and Carla Homstad. *Engineering in the Far North: A History of the U.S. Army Engineer District in Alaska.* Missoula, MT: Historical Research Associates, 1997, 273.

No sooner had the first 31 stations been built, than the system expanded to accommodate the new Ballistic Missile Early Warning System. To maintain redundant lines of communication in case of an attack or the failure of one system, there were two new expansions. The first was the coastal route from Clear AFB to Ketchikan, where an undersea cable connected White Alice to Port Angeles, WA. A second interior route linked White Alice to the Canadian microwave network and thence to the continental United States. The coastal route featured five additional tropo stations and three microwave sites. The interior (shorter) route consisted of eight microwave stations.

BMEWS Network

(A) Active
(D) Demolished
(E) Empty/Abandoned
(R) Repurposed

Coastal Route (tropo sites identified with *)	Interior Route
Aurora	Beaver Creek (E)
Black Rapids (E)	Canyon Creek (E)
Boswell Bay* (D)	Cathedral (R)
Cape Yakataga (E)	Delta Junction (R)
Clear (R)	Gerstle River
Donnelly Dome (D)	Gold King Creek (E)
Duncan Canal* (D)	Knob Ridge
Harding Lake (D)	Tok Junction
Hoonah* (R)	
McCallum	
Murphy Dome (D)	
Neklasson Lake (D)	
Ocean Cape* (D)	
Paxson	
Pedro Dome (D)	
Sawmill	
Sheep Mountain	
Smuggler Cove* (D)	
Tahneta Pass	
Tolsona (R)	

When the Aleutian DEW Line stations were built in the late 1950s (Operation Stretchout), they incorporated WACS facilities, with no separate sites. Communications from the Aleutians were crucial but, prior to White Alice, were notoriously unreliable. The radio link in place at the time of the Japanese attack on Dutch Harbor in June 1942 was so patchy that one historian called it a "Rube Goldberg system," barely functional even in rare good weather.[134]

Operation Stretchout

Port Heiden (D)	Port Moller (D)
Cold Bay (D)	Cape Sarichef (E)
Driftwood Bay (D)	Nikolski (D)

[134] Garfield, Brian. *The Thousand Mile War: World War II in Alaska and the Aleutians*. Fairbanks, AK: University of Alaska Press, 1995, 27.

The final phase of WACS deployment came in 1961, when Project Bluegrass extended the White Alice system to the Adak and Shemya islands.[135] Employing previously untried 120-foot parabolic tropo reflectors, the WACS at Adak and Shemya communicated with each other a distance of 393 miles, completing the Aleutian White Alice system and reliably linking the Aleutians with the Alaskan mainland.[136]

***WACS 1**

The complete WACS system spanned 170,000 voice-channel miles, 50,000 teleprint-channel miles, and over 3,000 linear Alaskan miles. For the civilian population, WACS augmented the bush-phone service by providing another communications link to at least 20 communities too remote for even ACS to reach.[137] Alaska's civilian population came to depend on WACS, as it had depended on its predecessors. WACS gave the new state of Alaska unprecedentedly reliable long-distance communications.[138]

At its inception in the mid-1950s, tropospheric backscatter was the most sophisticated communications technology the world had known. It was certainly complex. In the early 1960s, WACS boasted 1.5 million miles of circuitry, enough to circle the earth 57 times.[139] Yet like the DEW Line it served, White Alice was approaching obsolescence before it was dedicated at Elmendorf AFB on March 26, 1958. The launch of Sputnik six months earlier signaled the dawn of the space age, lighting the path for the communications satellite (SATCOM) in 1973. The Air Force never upgraded WACS' slow and cumbersome Klystron vacuum tube system, and in 1977, USAF began to close the tropo sites.[140]

***WACS 2**

The United States military sought to divest itself of responsibility for Alaska's telephone service. In 1967, Congress passed the Alaska Communications Disposal Act, authorizing the sale of government-owned communications in Alaska. The ACS was privatized in 1971, and, in 1973, ALASCOM (RCA's Alaska Communications, Inc.) began negotiations with the Air Force for purchase of the White Alice system itself. On August 14, 1983, the U.S. military concluded 80 years of long-line communications in Alaska, when ALASCOM handed the USAF a check for the sum of $135,348.45.[141] The last tropo connection, between Cape Yakataga and Boswell Bay, went offline in 1984.[142]

Shutting down WACS meant that the Air Force simply left, with $3.7 million worth of property and furnishings still in place.[143] By 2012, many WACS sites had been partly or completely demolished. Debate continued regarding the status of Anvil Mountain, near Nome, as recently as 2010.[144] Some stations, such as Aniak, have been repurposed. The Aniak WACS site also served as a middle school from 1981–2003.[145] The Boswell Bay installation was nominated for inclusion in the National Register of Historic Places. It was demolished in 1987

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[135] ALCOM History, 1961, 3.
[136] Denfeld, *The White Alice Communications System*, 12.
[137] Kursh, 215.
[138] Baker, 229.
[139] Reynolds, Georgeanne Lewis. *Historical Overview and Inventory: White Alice Communication System*. Anchorage, Alaska: U.S. Army Corps of Engineers, 1988, 6.
[140] Reynolds.
[141] Baker, 230–231.
[142] Denfeld, *The Cold War in Alaska*, 17.
[143] Hummel, *Alaska's Militarized Landscape*, 267.
[144] "Nome's Iconic Cold War Radar Towers May Soon Be History." *Anchorage Daily News*, 12 July 2010. http://www.adn.com/2010/07/12/1363488/nomes-iconic-radar-towers-may.html#storylink=misearch. Accessed July 2012.
[145] Alaska Department of Environmental Conservation, Spill Prevention and Response, Aniak White Alice Site. http://dec.alaska.gov/spar/csp/sites/aniak.htm, accessed July 2012.

after extensive documentation by the U.S. Forest Service.[146] Rather than specific sites, the White Alice system as a whole is listed in the National Register of Historic Places.

Tropospheric stations had composite buildings housing support and operation functions, and four 60-foot, concave billboard antennae each. Two antennae transmitted and received in each direction up and down the chain. Microwave stations were much smaller and easily identifiable, with a 150-foot-high steel tower at each site with an ear-shaped antenna mounted atop. Boswell Bay had a separate radio relay building rather than a composite structure.[147] Stations along roads were the TD-2 microwave type. Pedro Dome, a typical station, had POL tanks, a security fence, an auto maintenance shop, water cisterns, power, heat and water buildings, and a warehouse.[148]

***WACS 3**

Intercept and Respond

The Cold War marked the advent of the modern jet and rocket ages. Like radar, jets and rockets were prewar technologies whose true significance and potential were realized only after World War II. Manned and unmanned aircraft with extraordinary offensive capabilities—flying faster, higher, and farther than ever before—became the weapons of choice. Their development both equipped Cold War militaries and spurred the competing powers' 40-plus-year race for technological and military supremacy. America, relatively late in the jet and rocket propulsion games at the war's outset, needed to quickly develop new weapons and strategies or risk falling victim to the Soviets.

In the minds of the American air defense strategists, air defense consisted of detection, identification, interception and destruction of incoming threats.[149] Radar and communications figured prominently in the first three. Destruction of incoming threats required interceptor aircraft, anti-aircraft artillery and, by the 1950s, surface-to-air missiles.

As early as 1946, the American-Canadian Permanent Board on Joint Defense began planning for strategic polar defense. The defense net built on relationships (and used bases) established during World War II, when the United States had occupied Iceland and placed Greenland under its protection. The U.S. entered into negotiations with future fellow NATO members Denmark, for military use of Greenland,[150] and Iceland, for similar arrangements.[151] The polar concept persuaded Air Force Commanding General Carl Spaatz to tell his commanders in fall 1946, "Development of the Arctic front is our primary operational objective."[152] Alaska, no less than other Arctic territories, would serve as an American listening post and have bases for intercepting Soviet aircraft and missiles.

On September 3, 1949, a WB-29 aircraft fitted for long-range reconnaissance, flying from Japan to Eielson AFB in Alaska at 18,000 feet, discovered atmospheric traces of the first Soviet atomic test. Though President Truman waited until September 23 to inform the American people, the Russian A-bomb was a reality, and a new sense of urgency invaded the American air defense establishment.[153] Nine months later, Soviet-sponsored

[146] Denfeld, *The Cold War in Alaska*, 228.
[147] Denfeld, 221.
[148] Denfeld, 224.
[149] Schaffel, 72.
[150] Sullivan, Leonard J., S.J. *The United States and Greenland During World War II*. Master's Thesis, San Francisco: University of San Francisco Press, 1967, 126.
[151] Archer, Clive. "The Nordic Area as a 'Zone of Peace.'" *Journal of Peace Research* 33 no. 4 (Nov. 1996) 451–467, 459.
[152] Schaffel, 58.
[153] White, 40–41.

North Korean troops streamed south over the 38th parallel into South Korea, igniting the Korean War. Alaska, in its position on the Great Circle route to Japan and Korea, saw its military presence and infrastructure expand rapidly. In 1952, accelerated construction programs and military commitments in Alaska brought in $170 million in defense spending.[154] The race to achieve an air defense shield was underway.

Initially, the purpose of air "defense" was not to shoot down Soviet bombers, but to allow the Strategic Air Command (SAC) sufficient time to respond offensively.[155] In the wake of the 1947 military reorganization and creation of the Joint Chiefs of Staff, the Air Force would become the preeminent branch of service. In the new atomic world, as planners focused on the problems of nuclear war and struggled to formulate a role for conventional forces, SAC was in possession of the United States' nuclear arsenal.

As the philosophy of deterrence was established early in American defense circles, so was its corollary, the concept of "forward deployment." Forward deployment called for strategic (nuclear bomber) forces to be positioned in quick response distance to the enemy. The problem with forward deployment, Research and Development Corporation (RAND) analysts discovered, was that the enemy—and its own strike capability—was correspondingly close to you. By the mid-1950s, Air Force strategists determined that the flaws inherent in forward deployment outweighed the perceived deterrent effect.

President Eisenhower's national strategic policy of "massive retaliation" to a Soviet attack made a preventive war a non-issue.[156] The result was the Fullhouse concept, as the United States upped the ante by successfully detonating the world's first hydrogen bomb in 1952.[157] Combined with the strategic edge of the long-distance B-52, the role of SAC bases in places like Alaska changed from preemptive strike to dispersal, refueling, and post-strike support by 1966.

*Picture??

Nike Hercules, 1959–1979

Anti-aircraft guns, however effective they had been over the Third Reich and the Japanese Empire, quickly proved inadequate to provide reliable defense against faster, higher-flying aircraft and, in particular, missiles. The success of the German V1 and V2 programs before the end of World War II showed a nation's vulnerability to the new forms of aerial attack. The limits of conventional anti-aircraft artillery (AAA) in the early jet and rocket ages stimulated research and development toward viable guided missile systems as early as 1945. The U.S. Army selected Western Electric Company and Douglas Aircraft as prime contractors. The missile system they developed was known as Nike, for the Greek winged goddess of victory. Although unable to meet the growing ICBM threat, Nike reflected the technological peak of the bomber-interception mission so foremost in defense planners' minds during the 1950s.

Accelerated by the Berlin Crisis, the 1949 Soviet atomic test, the outbreak of the Korean War, and the dark assessment of Soviet intentions promulgated in *NSC-68*, the American surface-to- air missile research program produced a viable Nike I (designated SAM-7-A) missile system by early 1951. Nike I (renamed Nike Ajax) was first fielded in 1954 at Fort Meade, Maryland. Within two years, it outnumbered conventional 90-mm and 120-mm AAA batteries and replaced them in the U.S. by 1958.[158] The new missile, a supersonic unit capable

[154] Nielson, 190.
[155] Schaffel, 251.
[156] Schwartz, 20.
[157] Kaplan, Fred. *The Wizards of Armageddon*. New York: Simon and Schuster, 1983, 85–108; Arnold, James R., and Roberta Wiener, ed. *Cold War: The Essential Reference Guide*. Santa Barbara, CA: ABC-CLIO, 2012, xxv.
[158] Denfeld, D. Colt. *Nike Missile Defenses in Alaska: 1958–1970*. Anchorage, Alaska: U.S. Army Corps of Engineers, 1988, 2.

of engaging enemy aircraft flying up to 1,100 knots, at a range up to 25 nautical miles and a ceiling of 60,000 feet, immediately rendered anti-aircraft guns of any type obsolete.[159] The Nike Ajax never made it to Alaska, but its successor served in Alaska from 1959 into the 1970s.

As Nike Ajax installations were placed around the United States, a new generation of Nike appeared, with vastly superior capabilities. Called Nike Hercules, this missile was nuclear capable and able to engage a 1,500-knot maneuvering aircraft at ranges up to 85 nautical miles and altitudes exceeding 80,000 feet. Moreover, the Nike Hercules could be pressed into service as a short-range, surface-to-surface missile and was available in either a fixed installation or semi-mobile firing platform.[160] By the mid-1960s, Nike Hercules had replaced its smaller, conventional predecessor and was already on its way to phase-out in much of the country as new missiles entered production. However, Nike Hercules would defend Alaska until nearly the 1980s.

The Department of the Army announced in 1958 that Nike Hercules installations would be placed in Alaska. The first Nike installation was Site Bay near Anchorage, activated March 20, 1959. Sites Point and Summit, near Anchorage, and Sites Tare, Peter, Mike and Jig, near Fairbanks, achieved initial operational status in May. Fairbanks' Site Love began operations in 1960. Nine Nike batteries at eight sites formed the air defense artillery arm of ALCOM.[161]

Nike Missile Batteries in Alaska

	Battery/Name		Operation Dates
Fairbanks/Eielson:	A	Tare	1959–1971
	B	Peter	1959–1971
	C	Mike	1959–1970
	D	Jig	1959–1970
	E	Love	1959–1971
Anchorage:	A	Point (2 batteries)	1959–1979
	B	Summit	1959–1979
	C	Bay	1959–1979

***Nike 1**

Pursuant to a 1957 memorandum by Secretary of Defense Charles E. Wilson, and settling a long-running inter-service argument, the United States Army Alaska (USARAL) was designated as the service responsible for "point defense" weapons such as Nike.[162] The USARAL Air Defense Group directed two Army missile battalions stationed at Fort Wainwright and Fort Richardson. Fort Wainwright supplied logistical support for the 2nd Missile Battalion, 562nd Artillery. Fort Richardson supported the 4th (redesignated the 1st in 1972) Missile Battalion, 43rd Artillery.

Like other components of the Alaskan detection and defense network, Nike batteries in Alaska performed and were designed to operate under extreme climatic conditions. Frequent atmospheric disturbances, ice, wind, and bone-numbing cold were features of the normal operating environment. Specially designed clamshell covers of stressed metal skin permitted periodic radar de-icing and maintenance. Thermal elements under the concrete

[159] Alaskan Air Command History, 1 Jan.-30 June 1958. Elmendorf AFB, AK, 16.
[160] ALCOM History, 1 Jan.-30 June 1958, 16.
[161] Unless otherwise noted, the following extensive detail is found in Denfeld, D. Colt. *Nike Missile Defenses in Alaska: 1958–1979*. U.S. Army Corps of Engineers Alaska District, January 1988.
[162] AAC History, 1 July-31 December 1956, 10.

launch aprons controlled the buildup of ice and snow. Utilidors protected the lines of communication and utilities. To avoid permafrost, launch structures were built aboveground.[163]

***Nike 2**

The sophisticated technology of guided missiles required the integrated actions of 125 soldier/technicians to operate a Nike site. Alaska's Nike batteries were on round-the-clock alert, requiring shifts of 50 or more people to be housed on-site at a time. Guardhouses were staffed, and sentry dogs patrolled the fence lines of the outer perimeter 24 hours a day.[164]

Like the detection net, Nike was connected to NORAD via the White Alice Communication System. If a DEW Line or AC&W station registered an unidentified aircraft, information on the number, speed, direction and altitude would be relayed by White Alice facilities to the NORAD centers. The Nike site's acquisition radars would sweep the skies for the aircraft. Once an enemy was identified and confirmed, target-tracking radar locked on, feeding data to the missiles readied at the launch structure. Nike Hercules would launch on the command of the Battery Control Officer. In flight, radars and computer would work in tandem to keep the missile on target to the impact point where the warhead would detonate.

Alaskan Nike sites Peter and Summit were unique among Nike installations in the United States. They were the only Nike Hercules missile batteries on American soil to hold on-site firings. Targets included computer-generated points in space, and miniature airplane drones. Early firings exposed weaknesses in the tactical radar systems, and by 1962 sites had high power acquisition (HIPAR) radars. Live firings from Site Summit stopped in 1964, though Site Peter continued them at least through 1968.[165]

***Nike 3**

Nike Hercules sites were critical elements in the overall U.S. air defense network. They provided a demanding American public a technologically advanced defense against Soviet bombers striking the American heartland. In Alaska, Nike Hercules missile batteries operated from 1959 to 1979. Nike combined Cold War cutting edge technologies of computerization, rocketry, and nuclear warheads into a lethal weapon system.

Nike Hercules sites have structures in two separate areas, defined by function and located according to local terrain. The launch area generally included two missile launch and storage structures, a launch control and general operations building, missile maintenance shop, motor repair shop, fuse and detonator magazine, warhead magazine and dog kennels. This area was protected by a double fence, alarm intrusion system, and sentry station.

The battery control area had the operations building, which held the target tracking and missile tracking radars, barracks and living facilities; a high power acquisition radar (HIPAR) building with radar; and repair shop. The battery control area was sited at a higher elevation than the launch control for the proper line-of-sight. It was sited within 5,000 feet of the launch area to offer the same point of reference for target and missile tracking radars.

The frenetic pace of technological change rendered the Nike Hercules missile system obsolete within a decade of its deployment in Alaska. As Secretary of Defense Robert McNamara predicted, by the end of the 1960s, the

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[163] Denfeld, *Nike Missile Defenses in Alaska*, 11.
[164] Hollinger, Kristy. *Nike Hercules Operations in Alaska: 1959–1979*. Conservation Branch, Directorate of Public Works, U.S. Army Garrison Alaska, July 2004, 39.
[165] Denfeld, *Nike Missile Defenses in Alaska*, 2.

nation's cities and strategic bases were so vulnerable to Russian ICBMs that vulnerability to actual bombers had little relevance.[166] As the missile threat eclipsed the threat of manned bombers, Nike Hercules was eclipsed by Anti-Ballistic Missile (ABM) systems like the SAM-D, later known as Patriot, although actual ABM deployment was limited to a negligible number by the 1972 Salt II Treaty. Nike Hercules ended 20 years of service in Alaska when the remaining three Nike batteries closed on May 10, 1979. They were among the last Nike Hercules batteries to be deactivated in the U.S.[167]

***Nike 4**

Although Nike Hercules operations ended in Alaska in 1979, the program's legacy remains in the form of physical properties. Alaskan Nike Hercules sites have come to various ends. Many were looted, and most were later demolished or repurposed by military and civilian agencies. Sites Peter and Mike, on military land near Fairbanks, have been demolished. The Army Corps of Engineers and the Fairbanks North Star Borough retain the first and second launch buildings at the former Site Tare near Fairbanks, along with a warhead storage igloo. The battery control facilities at Site Bay served from 1983 to 1986 as a minimum-security prison for the Alaska Department of Corrections and were subsequently taken over by the University of Alaska. Lastly, Site Point became Anchorage's Kincaid Park, with some of its buildings remaining.[168] Due to its status as the only remaining complete Nike facility, Site Summit, 12.5 miles from Anchorage, was included in the National Register of Historic Places in 1995. Site Summit, still under U.S. Army control, was also the subject of a 2009 U.S. Army Garrison Alaska (USAGAK) historic district building retention proposal. The Army planned to create a historic district, securing structures critical to understanding Site Summit's history while simultaneously meeting training needs and preventing vandalism.[169] In 2012, the Army, the State of Alaska and an organization called "Friends of Nike Site Summit" were cooperating on the rehabilitation and preservation of select structures.[170]

Elmendorf Air Force Base, 1940-Present

Elmendorf Air Force Base in Anchorage has served over the years as headquarters of the Alaskan Defense Command, Alaskan Command, Alaskan Air Command, and 11th Air Force. It has been the Alaska Air Command (AAC) headquarters since 1946 and the Alaska Command (ALCOM) headquarters since 1947. It was an important air-intercept base, NORAD Regional Combat Center, and administrative center for all military activities in Alaska throughout the Cold War. Elmendorf remains the nerve center of the U.S. military presence in Alaska.

Army Air Corps commander Major General Henry H. "Hap" Arnold visited Alaska in spring 1939. He concluded that Alaska was utterly unprepared for war, be it with Japan or the USSR. His whirlwind tour resulted in a congressional appropriation of $4,000,000 for the construction of a cold-weather test facility at Fairbanks and an Army post and airfield at Anchorage, set aside by executive order in April 1939.[171] Its runways laid out under the supervision of Arnold himself, Elmendorf Field on Fort Richardson was named for test pilot Captain Hugh Merle Elmendorf, a pioneer of aerial gunnery and formation flying, killed while testing the Consolidated Y1P-25 fighter in January 1933.[172] Airfield construction started in June 1940, and the first

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[166] Hollinger, *Nike Hercules Operations*, 61.
[167] Alaska Office of History and Archaeology, Department of Natural Resources. *Site Summit Nike Hercules Missile Installation*. Anchorage, AK, June 1996, 15.
[168] Hollinger, 63–64.
[169] "Site Summit Retention Plan, Fort Richardson, Alaska." Anchorage, AK: CH2M Hill, August 2010.
[170] Nike Site Summit, http://www.nikesitesummit.net/. Accessed July 2012.
[171] Pamphlet 360-5, 89; Garfield, 61.
[172] Captain Elmendorf, along with Major Arthur K. Ladd, had no connection with Alaska or the Arctic; neither did General Jonathan M. Wainwright IV, whose namesake replaced Ladd AFB in 1961. By contrast, Generals Wilds P. Richardson and Adolphus W.

Army Air Corps personnel arrived in August. As at Ladd Field near Fairbanks, building a military installation with a safe, stable runway in subarctic conditions, under threat of imminent war, was a gargantuan undertaking. General Arnold observed in 1940 that "we had spent only a few hours in Alaska before it was evident that it is one thing to decide that national defense requires air bases up near the Arctic Circle... and quite another to accomplish these results."[173] Still incomplete, Fort Richardson and Elmendorf Field were inaugurated 12 November 1940.

The Quartermaster Corps constructed much of Elmendorf Field, though the U.S. Army Corps of Engineers took over the project in January 1941. Initial facilities included two concrete runways with aprons, four hangars (one temporary), POL storage and fueling, and concrete bomb and ammunition storage igloos. Housing provided for a 7,000-man garrison, and the base hospital had 294 beds. Elmendorf/Richardson had its own water system, separate from Anchorage utilities. Construction at Elmendorf peaked in August 1941, with 3,415 contractors and government civilians on the payroll. Anchorage consequently boomed, flush with troops and contractors. No sooner had the original base been constructed than the Army's December 1941 "Program of Additional Construction," issued after Japan's attack on Pearl Harbor, prescribed approximately double the existing housing. The new addition made space for another 250 officers and 7,500 enlisted men. 1942 saw the addition of a war-reserve gasoline storage system comprised of four 24,000-barrel tanks, along with four satellite airfields complete with taxiways and revetments. By spring 1943 a 400-unit Alaska air depot had been authorized, made up of hangars, warehouses, administration and technical buildings, and a civilian housing area for 900 employees.[174]

***Elmendorf 1**

Despite all the World War II construction, Elmendorf's infrastructure was woefully inadequate for the needs of the Cold War.[175] Elmendorf's expansion has not been uniform, as military construction is dictated not by need alone but also by congressional budget concerns. Along with the rest of Alaska's bases, Elmendorf suffered the pangs of a Congress weary of war and military appropriations, losing $13.7 million (shared with Fort Richardson) worth of construction budget in 1948 alone.[176] However, during that lean time, Building 5-800, Alaskan Command and Alaskan Air Command Headquarters, was completed at a cost of $1,660,551.[177]

Elmendorf served during World War II as a staging area for the Aleutian campaign.[178] The base assumed its command authority on 1 October 1946, when the Alaskan Air Command moved its headquarters from Adak to Elmendorf, in consonance with the end of hostilities with Japan.[179] Recognizing the primacy of air power, the mandate for the newly-formed Alaskan Command specified that an Air Force general would assume overall control. AAC would be responsible for all regions and operations excepting Fort Richardson and the Port of Anchorage, given to USARAL. The Aleutian chain fell under ALCOM's naval component, the Alaskan Sea Frontier.[180]

Greely, along with Colonel William O. Eareckson and Carl Ben Eielson—whose names grace several other Alaskan installations (Greely had two forts named after him)—were major figures in Alaskan or Arctic history. Fact Sheet, "Captain Hugh Merle Elmendorf." http://www.jber.af.mil/library/biographies/bio.asp?id=9076. Accessed June 2012; Garfield, 61.

[173] *National Geographic*, October 1940, in Price, Kathy. *The World War II Heritage of Ladd Field, Fairbanks, Alaska.* Fort Collins, CO: Center of Environmental Management of Military Lands, Colorado State University, 2004, 6.

[174] Mighetto and Homstad, 38–39.

[175] ALCOM History, 1 January 1952-30 June 1956, Vol. I., 48.

[176] Mighetto and Homstad, 167.

[177] Cloe, *Top Cover for America*, 160.

[178] Smith, Blake W. *Wings Over the Wilderness: They Flew the Trail of '42*. Surrey, BC: Hancock House, 2008, 49.

[179] Denfeld, *The Cold War in Alaska*, 105.

[180] ALCOM History, 1947–1951, vi.

Since World War II, Elmendorf has grown tremendously and, with Eielson, was listed in 1971 as one of the largest Air Force bases in the world.[181] The modern Air Force base owes its genesis to the Army's move to a new Fort Richardson site in 1950, which allowed the brand-new United States Air Force to rename the entirety of old Fort Richardson "Elmendorf Air Force Base."[182] Construction continued apace, as troop numbers climbed. Elmendorf's housing units alone have expanded several times.[183] Additional new facilities were erected to serve the Minimally Attended Radar System in 1982—illustrative of Elmendorf's position as the headquarters for virtually every major defense system in Alaska.[184] Other prominent, more recently built structures include the new Combat Alert Cell, maintenance hangars, a base exchange and a commissary.[185] One major geological event briefly impacted Elmendorf's construction. The 1964 Good Friday earthquake, one of the largest on record, mildly damaged Elmendorf even as it ravaged Anchorage. The air base escaped with damage to the hospital and power plant.[186]

Buildings still standing from Elmendorf's early construction period include several Operations-type hangars, a birchwood hangar, and the Alaska Chateau, a guest quarters built in 1942 that has housed such luminaries as General of the Army Douglas MacArthur, Bob Hope, and then-Senator John F. Kennedy.[187]

***Elmendorf 2**

The National Security Act of 1947 created the U.S. Air Force as a separate branch of service, with three operating commands. The Strategic Air Command, with its focus on major nuclear strike capability, dominated Air Force thinking. SAC was supported by the Tactical Air Command or battlefield operations command. The third, Air Defense Command, was tasked with protecting the U.S. from the growing Soviet air threat. Numbered air forces served as intermediate commands. In Alaska, the 11th Air Force, designated Alaskan Air Command, was responsible for nearly all theater operations.[188] In keeping with its broad mission, Elmendorf adopted the slogan "Top Cover for America" in 1952.[189] An ALCOM spokesman asserted in 1960, "We are in Alaska to warn our nation of air attack and to destroy enemy aircraft, to protect military installations, and to prevent an enemy from gaining a foothold in Alaska." Elmendorf, headquarters of ALCOM and AAC, shared that mission. Over the 70 years since its founding, Elmendorf's mission has shifted from staging and headquarters to include fighter/interceptor operations, search and rescue, logistical support for all Alaskan Air Force operations including DEW Line and AC&W resupply and ice island missions, ground attack, and command and control for the Alaskan Air Command and the entire Alaskan military establishment.

***Elmendorf 3**

Fighter defenses in Alaska grew swiftly from World War II-vintage F-51 Mustangs to a parade of Cold War interceptors. F-80s, F-94s, F-89s, and F-102s replaced each other in rapid succession within a decade.[190] Along with Eielson AFB, Elmendorf hosted a SAC unit during the early 1960s, though its duties primarily lay elsewhere. The SAC B-47s, twin to those at Eielson, served at Elmendorf 1960–1966.[191]

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[181] Bergeron, Noel L. "The Military Importance of Alaska and Its Role in the Future." Alexandria, VA: Defense Technical Information Center, 1971, 11–12.
[182] Pamphlet 360-5, 89.
[183] Mighetto and Homstad, 278, 339.
[184] Mighetto and Homstad, 344.
[185] Denfeld, *The Cold War in Alaska*, 105.
[186] Mighetto and Homstad, 226.
[187] Denfeld, 106–107.
[188] Price, Kathy. *Northern Defenders: Cold War Context of Ladd Air Force Base, Fairbanks, Alaska, 1947–1961*. Fort Collins, CO: Center of Environmental Management of Military Lands, Colorado State University, 2001, 8.
[189] Cloe, *Top Cover for America*, 187.
[190] Fact Sheet: Elmendorf History. http://www.jber.af.mil/library/factsheets/factsheet.asp?id=5280. Accessed June 2012.
[191] Cloe, *Top Cover for America*, 1960.

Following the frenetic 1950s, AAC's air power declined, with five squadrons deactivated statewide. The decline in fighter strength parallels the Cold War's increasing emphasis on higher technology and smaller numbers of conventional forces with greater capability. In 1970, Elmendorf welcomed its first F-4E Phantom IIs, which gave the AAC a long-range air defense and ground support capability.[192] F-15A Eagle multi-role fighters replaced the F-4Es starting in 1982 and shepherded Alaska through the final phase of the Cold War.[193] The last F-15s departed Elmendorf in September 2010, replaced by F-22 Raptors.[194]

While the Alaskan Air Command was primarily an air defense command from 1951 to 1970, throughout the 1950s, Elmendorf gradually expanded its responsibility to encompass nearly all facets of Alaskan defense.[195] Elmendorf's importance grew even as Air Force strength in Alaska dwindled. 1952, the summit of Alaska's Cold War construction boom, saw Alaska split into two short-lived air defense areas of responsibility. Area I, south of 63 degrees, had Elmendorf as head. Area II, north of 63 degrees, was the responsibility of Ladd AFB.[196] The scheme did not survive Ladd's closure, and the air divisions were inactivated 25 August 1960. By 1960, all AC&W sites reported to Headquarters; AAC and the DEW Line's Alaskan segments would soon follow.[197]

***Elmendorf 4**

Since Elmendorf's inception, a significant portion of its time and resources has been devoted to supporting Alaskan operations and its enormous military infrastructure.[198] Elmendorf-based squadrons maintained and operated the AC&W stations, and the 10th Air Division resupplied all radar sites south of the Alaska Range.[199] With Army and Navy assistance, Elmendorf coordinated an ongoing, complex resupply operation, known first as Mona Lisa and then as Cool Barge, for the AC&W sites, the DEW Line, and Galena FOB.[200] Logistics were complicated by the Alaskan weather and the remoteness of the DEW Line and other sites, many of which were above the Bering Sea ice line. ALCOM deemed supply a "theater necessity."[201] Mona Lisa, so named in 1953 after two years of resupply, involved fleets of barges and ships loading supplies at Seattle and bringing them to the various sites. Barges served Interior locations on the river system. In 1958, the military contracted barge and ship resupply to civilians. Still, AAC maintained control until the Military Sealift Command—through an office at Elmendorf—took over in 1964.[202] Mona Lisa was renamed Cool Barge in 1966, but its operations continued unchanged.[203]

One of Elmendorf's most unusual support operations was the resupply and evacuation of T-3, also known as Fletcher's Ice Island, a chunk of ice in the Arctic Ocean sporadically used for military and civilian research between 1952 and 1961.[204] Elmendorf was the evacuation point when T-3 was abandoned in October 1961.[205]

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[192] Cloe, 233, 235–238.
[193] Cloe, 245.
[194] Fact Sheet: 3rd Wing Unit History, Lineage, and Honors. http://www.jber.af.mil/library/factsheets/factsheet.asp?id=5432. Accessed June 2012.
[195] Cloe, 191.
[196] AAC History, 1 July-31 December 1950.
[197] Cloe, 210–211.
[198] Air Force historian John Cloe noted that especially during the 1960s, one of the Alaskan Air Command's major missions was the support of other Air Force commands and agencies in the state.
[199] Cloe, 187.
[200] ALCOM History, 1967, 1967, 85.
[201] ALCOM History, 1 January 1952-30 June 1956, Vol. I., 47.
[202] Cloe, 173.
[203] ALCOM History, 1967, 80.
[204] Shanks, Mary K., and Jennifer Grayburn. *Cold Weather Testing in Alaska: 1940–1970*. Fort Collins, CO: Center for the Environmental Management of Military Lands, Colorado State University, 2012, 16.
[205] ALCOM History, 1961.

Though Ladd and Eielson were involved extensively, Elmendorf acted as headquarters for resupply operations. Operations were daunting, as illustrated by two efforts in 1952. In late June, a C-47 laden with supplies flew from Elmendorf to T-3 by way of Ladd, Barter Island, and Thule—using dead reckoning. Landing was risky due to soft spots on the ice runway, and the C-47 broke a ski, repaired on-site. A follow-up in September by a C-47 and a C-54 nearly resulted in the loss of the C-47 as the planes attempted to find their way.[206] In 1957, SAC received responsibility for T-3, as it had drifted away from ALCOM's area of responsibility and into that overseen by Thule Air Base. Two other ice stations, Alpha and Charlie, were ALCOM's responsibility. Alpha, established for little more than a year, broke up in 1958, and its fellow, Charlie, lasted an even shorter time, from April 1959 to its disintegration in January 1960. In September 1961, ALCOM relinquished T-3 to the Navy; the island having floated back into Alaskan control with the pack ice.[207]

***Elmendorf 5**
***Elmendorf 6**

To control the rapidly expanding air defense and warning network across the United States and Canada, the North American Air Defense Command was created on 19 May 1958.[208] On 10 June 1958, Commander in Chief, Alaska (CINCAL) received the title Commander, Alaskan NORAD Region (ANR). ANR encompassed all air defense assets in Alaska. By December, further guidance dictated that CINCAL would exercise authority through Commander, AAC.[209] In practice, command of the Alaskan NORAD region meant more resupply and maintenance responsibilities than ever, and a busier schedule of exercises.

The escalating Vietnam War had a significant impact on the Alaskan Command; one deleterious to its ability to conduct the Cold War mission.[210] In addition to pulling troops and shifting training schedules, the U.S. military expanded Elmendorf's duties to include serving as a key refueling point for cargo aircraft serving Vietnam, including the C-5A Galaxy, C-141, and C-131D-6.[211] Elmendorf's need for additional fuel grew so rapidly that even as appropriations for housing and training dried up, ALCOM in 1965 requested an oil pipeline from Whittier to Anchorage. The pipeline was approved in 1966. Once again, Alaska's position on the Great Circle air route proved its strategic importance.[212]

The Cold War Alaskan Command did not survive Vietnam. On 1 July 1975, ALCOM was disbanded, and control of Alaska's assets remanded to the various services.[213] A victim of early 1970s force realignments, ALCOM was preceded by ALSEAFRON (1971) and USARAL (1974). Only AAC escaped dissolution. ALCOM was not replaced, but it was succeeded by a contingency command designated as Joint Task Force-Alaska, which could be activated when necessary by the Joint Chiefs of Staff. AAC became the dominant command in Alaska and assumed control of the Alaskan NORAD Region for the next 14 years.[214] However, in 1989, ALCOM was reconstituted as a subunit of the Air Force's Pacific Command—still headquartered at Elmendorf and with CINCAL once again in command of the Alaskan NORAD region.[215]

***Elmendorf 7**

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[206] "Resupply of Fletcher's Island," in AAC History, July-December 1952, 13–28.
[207] Cloe, *Top Cover for America*, 226.
[208] Grant, 324.
[209] ALCOM History, 1 July-31 December 1958, 25–26.
[210] In 1968, the Alaskan Command historian observed that though AAC remained in good shape, USARAL and ALSEAFRON were hard hit by Vietnam-related cutbacks (13).
[211] Nielson, 201.
[212] ALCOM History, 1966, 73.
[213] ALCOM History, 1975, v.
[214] Cloe, 233.
[215] Grant, 337.

Elmendorf has played host to numerous military organizations since its inception, and none so central to Alaskan military history as the 11th Air Force, Alaska's first air force command. It was designated on 5 November 1942. The tiny five-squadron, 3,067-man formation was tasked with the air defense of nearly the whole sector.[216] The 11th Air Force was preceded only slightly by the 18th Pursuit Squadron. The 18th arrived in February 1941 and was the first Air Force unit stationed in Alaska.[217] Elmendorf has had a staggering amount of units, including constant rotations of fighters, bombers, cargo planes, and even early warning aircraft. The largest of Elmendorf's present units is the 3rd Wing, comprised of five squadrons (including Air Force Reserve and Air National Guard) flying C-12s, C-17s, C-130s, E-3s, and F-22s.[218] The 673rd Air Base Wing supports the 3rd Wing's operations.

The Elmendorf Air Force Base of 2012 resembles the Elmendorf of the Cold War. It is still the headquarters of the Alaskan Command and the 11th Air Force. Fighter interceptors are still quartered there. It still plays a significant role in the economy of its host city, Anchorage. But the differences are substantial. Chief among them is Elmendorf's return to joint base status. The 2005 Base Relocation and Closure Report to President George W. Bush, advised the combination of Fort Richardson and Elmendorf Air Force Base, thus establishing Joint Base Elmendorf Richardson (JBER). USAF is the hosting service. On 30 July 2010, the 673rd Air Base Wing was activated as the host wing. 673rd combines the 3rd Wing and the U.S. Army Garrison Alaska's installation management functions. USAF lists JBER's current mission as "air sovereignty, combat training, force staging and throughput operations in support of worldwide contingencies."[219] The Alaskan Air Command is gone. In its place, with the same duties, the venerable 11th Air Force.[220] The Cold War has ended, but Elmendorf is still ready.

Ladd Air Force Base, 1939–1960

While Elmendorf is the center for the Air Force presence in Alaska and Eielson anchors the North, Ladd Air Force Base, now Fort Jonathan Wainwright, has the distinction of being the first Army Air Corps base in Alaska. Founded as a cold weather testing station in 1939, Ladd evolved into the hub of military activity north of the Alaska Range and served as the official handoff point for U.S. Lend-Lease planes headed to the Soviet Union during World War II. For the first years of the Cold War, Ladd held the northern air defense line against the USSR while fulfilling concurrent missions of cold weather testing and long-range reconnaissance.

Ladd's genesis bears remarkable similarity to that of Elmendorf AFB. It just came a few years earlier. Recommended by then-Lieutenant Colonel "Hap" Arnold in 1934 and authorized by the Wilcox Act of 1935, land near Fairbanks for the cold weather testing station was withdrawn in March 1937 by President Franklin Roosevelt under Executive Order 7596. Construction began in August 1939—weeks before Nazi troops invaded Poland and sparked World War II. Though supply and weather issues prevented most building efforts until spring 1940, initial construction was deemed complete by September. Ladd Field was named in honor of Major Arthur K. Ladd, a test pilot killed in an aircraft accident in South Carolina in 1935.[221] As the United States drew closer to involvement in World War II, Ladd's size increased and its mission expanded, pushing cold weather testing to the periphery.[222]

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[216] Perras, Galen Roger. *Stepping Stones to Nowhere: The Aleutian Islands, Alaska, and American Military Strategy, 1867–*1945. Vancouver: University of British Columbia Press, 2003, 62.
[217] Fact Sheet: Elmendorf History.
[218] Fact Sheet: 3rd Wing Unit History, Lineage, and Honors.
[219] Joint Base Elmendorf-Richardson—History. http://www.jber.af.mil/library/history/index.asp. Accessed June 2012.
[220] Fact Sheet: 11th Air Force History. http://www.jber.af.mil/library/factsheets/factsheet.asp?id=5421. Accessed June 2012.
[221] Woodman, Lyman L. *Duty Station Northwest: The U.S. Army in Alaska and Western Canada, 1867–1987,* Volume 2. Anchorage: Alaska Historical Society, 1997, 55.
[222] Hays Jr., Otis. *The Alaska-Siberia Connection: The World War II Air Route*. College Station, TX: Texas A&M University Press, 1996, 35.

***Ladd 1**

Ladd became a center of air traffic and a supply point. Ladd was incorporated into the military's defense of Alaska and the effort to supply the USSR with war materiel pursuant to the Second Protocol of the Lend-Lease Act.[223] Destined for the Russian Front, American planes took the Northwest Staging Route from the continental United States, following the route of the newly built Alaska Highway to Fairbanks. At Ladd, they were refitted, tested and handed to Soviet pilots who would ferry the aircraft to Nome, over the Bering Strait, and across the USSR for their rendezvous with the *Wehrmacht*. Between September 1942 and the war's end, the U.S., by way of Ladd Field, provided the Soviet Union with 7,924 fighters, bombers and transports.[224]

***Ladd 2**

America's entry into World War II changed Ladd from a planned installation into a rapidly expanding one with permanent and temporary buildings. Personnel demands swelled throughout the war. They were driven, among other factors, by the need for housing, supplies and translators for Russians and associated personnel, along with sufficient repair facilities to give the Russians properly maintained aircraft. Ladd grew tremendously in size, with over 5,000 military and civilians working on the base by fall 1944. By war's end, it could house 4,555 personnel. Construction at Ladd underwent three phases. The cold weather test station was followed by wartime expansion and Cold War realignment. Unusual for Alaskan bases, Ladd's original facilities were designed and partially constructed before American entry into (and preparation for) World War II. The original installation had a 5,000-foot runway and 16 buildings, arranged in a horseshoe and connected by utilidors large enough to be used as passageways. World War II's arrival found Ladd's original facility nearing completion. By 1945 the runway had been lengthened to 9,000 feet, and a tank farm had been constructed. [225] The prewar 16 buildings had mushroomed into 700, along with a secondary runway and the CANOL pipeline terminal.[226] One Ladd veteran recalled that the Army had "started out with a fine set of buildings, and then they got in a rush, why then they just threw up whatever they could."[227] Almost lost in a sea of birchwood hangars, barracks and other temporary structures, Hangar One was the center of activity at Ladd. The largest building in Fairbanks at its completion in 1941, the 327-foot by 271-foot structure housed Ladd's command headquarters until 1955 along with aircraft, other units and, during World War II, a sizeable contingent of Soviet flyers.[228]

***Ladd 3**

Following World War II, postwar austerity and force reduction measures left Ladd a shadow of its former self, as its mission required only a small portion of the base. Runways, hangars, ground-control facilities and housing were essential to the Cold War mission. Much of the rest of Ladd was not.[229] Hundreds of temporary buildings were destroyed or sold. Even with the removal of numerous buildings, the resulting oddity of a large infrastructure manned by a reduced force badly taxed the Air Force's logistical powers. Personnel cuts and the introduction of the F-89 Scorpion all-weather interceptor exacerbated the situation and helped lead to Ladd's

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[223] The Lend-Lease Act of 11 March 1941 allowed the still-neutral United States to aid any country "vital to the defense of the United States." Transcript of Lend-Lease Act. http://www.ourdocuments.gov/doc.php?doc=71&page=transcript. Accessed June 2012. Lend-Lease deliveries to the USSR were governed by four protocols, the first of which was signed 1 October 1941. The Second Protocol established the Alaska-Siberia Route. Rigge, Simon. *War in the Outposts*. Chicago: Time-Life Books, 1980, 77; Price, *The World War II Heritage of Ladd Field*, 1.

[224] Hays, 131.

[225] Price, *The World War II Heritage of Ladd Field*, 8.

[226] Price, 15–16.

[227] Acord, Randy, in Price, *The World War II Heritage of Ladd Field*, 15.

[228] Price, 18.

[229] Denfeld, *The Cold War in Alaska*, 112–113.

closure.[230] The original cold weather testing station, including Hangar One, was designated Ladd Field National Historic Landmark in 1985. While the landmark commemorates World War II, the same facilities that were used for Cold War interception and intelligence duties now comprise the Ladd AFB Cold War Historic District.

Immediately following World War II, Ladd Field was transferred to the 11th Air Force, designated as part of the Alaskan Air Command (AAC).[231] Its high latitude, nearly 65 degrees, was significant to the Cold War's polar concept.[232] Ladd AFB illustrated the AAC's defense concept, which focused on protecting Alaska's core populated areas and their infrastructure.[233] Such an approach meant the military presence in Alaska was concentrated at Alaska's two largest population centers and along the Alaska Railroad for easy resupply and rapid response. Elmendorf served as HQ, ALCOM and HQ, AAC. Ladd survived primarily due to its developed facilities, cold weather testing station, its function as the terminus of the CANOL pipeline, and its location at Fairbanks. Its official titles were Northern Sector Headquarters and 11th Air Division Headquarters. Practically speaking, Ladd was the hub of military activity north of the Alaska Range, serving AAC, SAC, and USARAL.[234] Early operations at Ladd Air Force Base, as it became known following the Air Force's creation in 1947, focused on reconnaissance, polar navigation and exploration, cold weather testing, and the primary combat mission– air defense.[235] The integrated combat role encompassed tactical ground support, fighter escort, arctic training exercises and base defense.

Air defense was Ladd's *raison d'etre*. On 1 September 1946, Ladd was designated Headquarters, Yukon Sector. The Yukon Sector became the 11th Air Division, tasked with defending all of Alaska north of the Alaska Range from Soviet air attack. The mission was straightforward– to find and shoot down the enemy. In a series of coordinated functions, AC&W or DEW Line radar would find the aggressors. AC&W and base-sourced communications would guide pilots and ground control, while fighters scrambled from Ladd and FOB Galena identified and engaged Soviet aircraft. The Air Defense Control Center would track and coordinate the action, while the AAA waited to intercept any enemy aircraft that made it past the fighters. In 1958, air defense control passed to Elmendorf, when the Alaskan NORAD Region Command and Control Center became active. The 11th Air Division comprised three fighter squadrons and up to ten AC&W squadrons by the late 1950s.[236] Interceptor types were mixed until 1954, when the Northrop F-89D Scorpion was introduced.[237] The F-89s were equipped with nuclear-tipped rockets designed to explode amid enemy bomber formations. Their sophisticated fire-control systems required extensive training and support and further taxed Ladd's resources.[238]

In 1946, SAC started planning worldwide strategic aerial reconnaissance. The first phase, before 1948, was photographic reconnaissance and mapping. From 1948 on, operations shifted to electronic intelligence (ELINT) gathering. Ladd supported both. Weather reconnaissance and long range detection (looking for Soviet nuclear detonations) was particularly important. Not only was Arctic flying dangerous at the best of times, but also U.S. strategic intelligence on Soviet capabilities was disturbingly scanty immediately after

[230] AAC History, January-June 1954; AAC History, July-December 1954, 100.
[231] Price, 8.
[232] ALCOM History, 1 January 1952–30 June 1956, Vol. I., 6.
[233] AAC History, 1945–47, 86.
[234] Price, *Northern Defenders*, 8.
[235] Price, 9.
[236] Price, 19–20.
[237] AAC History, Jan.-June 1952; AAC History, January-June 1954. The F-89, the first capable all-weather jet fighter to grace Alaskan airspace, arrived due largely to the AAC's operations Analyst, Mr. John Intlekofer, who recommended a replacement for the odious F-94 as early as 1952.
[238] "History of Ladd Air Force Base," in Lt. Col. Courtland D. Sawtelle, USAF Info Services Officer, to Office of Information Services, HQ, 11th Air Division, Seattle. N.d.

World War II, particularly in the Arctic.[239] Despite the efforts of Ladd's B-13s, B-50s, and WB-29s, intelligence stayed thin until U-2 spy planes and reconnaissance satellites were invented.[240]

***Ladd 4**

Notwithstanding its frustrating nature and meager strategic returns, reconnaissance paved the way for polar navigation, from understanding weather systems to operating aircraft in arctic conditions. The famed 46th/72nd Photo Reconnaissance Squadron, one of SAC's first such units, served at Ladd 1946–1949. During their brief tenure, the men of the 46th/72nd—among other feats—developed accurate polar navigation, surveyed the Alaskan coast and unmapped portions of the Interior, tested their men and equipment, and trained SAC bomber units in polar navigation and operations. Two of the 46th/72nd's most important missions were Project Nanook, the exploration and documenting of Alaska and the polar regions, and Operation Floodlight, the active search for heretofore-unknown polar landmasses.[241] Project Nanook flights resulted in the advancement of grid navigation techniques and enabled the practical use of the polar route for military and civilian aviation.[242] Operation Floodlight, while it revealed no new landmasses, did unearth the ice island T-1 on 14 August 1946 and led to the establishment of T-3.[243] The most significant military information uncovered by photo reconnaissance was the reassuring discovery over 1948–1949 that the Soviets were not massing in the Chukotka Peninsula. Ladd-based reconnaissance flights also aided international cooperation. In the Polaris project, the 46th/72nd primarily surveyed and mapped the Canadian archipelago between 1946 and 1948. National Geographic's new map of the Arctic credited USAF and Ladd AFB for their work.[244]

***Ladd 5**

The "Ferret flights," code-named by USAF, complemented Ladd's photo reconnaissance activities. ELINT, or electronic intelligence, involves acquiring information on the enemy's radar and communications systems. Aircraft would fly close enough to trigger the enemy's radar net, then link with their own ground stations to pinpoint the enemy's radar stations and evaluate their signals. This new, high-tech facet of reconnaissance has an Alaskan origin. A specially equipped 11th Air Force B-24 first employed ELINT on 6 March 1943, when it overflew Japanese-held Kiska Island scanning for possible Japanese radar emanations.[245] In the first of the so-called "Ferret flights," Ladd inaugurated U.S. electronic surveillance with SAC's only ELINT B-29 in 1947. Within a year, the craft were flying from all over the world. Not content with merely identifying Soviet radar and communications arrays, Ferrets also scanned the electronic spectrum hoping to uncover possible Soviet research and development projects. Special attention was devoted to discovering electronic advances, pilotless aircraft and guided missiles. Ladd's Ferrets found holes in the Soviet radar net. Their findings also led to the development of plans for waging war in the Soviet Far East. That the Soviets were aware of the American presence only made the flights more difficult and dangerous.[246] U-2 pilot Francis Gary Powers, shot down by a Soviet anti-aircraft missile on 1 May 1960, was on an ELINT and photo recon mission.[247]

Both photo and ELINT flights were frequently disguised as weather reconnaissance, a more innocuous but no less vital form of observation conducted at Ladd from 1946 until the base closed in 1961. These "Ptarmigan"

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[239] White, *World in Peril*, 11.
[240] Price, *Northern Defenders*, 11.
[241] Shanks and Grayburn, 8.
[242] Shanks and Grayburn, 11.
[243] AAC History, Jan.-June 1952, 220–240.
[244] Price, 14.
[245] Price, Alfred. *The History of U.S. Electronic Warfare, Volume I: The Years of Innovation - Beginnings to 1946*. Washington, D.C.: Association of Old Crows, 1984, 52–53.
[246] Price, *Northern Defenders*, 15.
[247] U.S. Department of State Vol. X, Part 1, FRUS, 1958–60: E. Europe Region; Soviet Union, Office of the Historian, 147. https://www.mtholyoke.edu/acad/intrel/u2.htm. Accessed June 2012.

and "Loon" sorties were codenamed depending on the sector. Loon missions were secret and focused on the Bering Sea. Ptarmigan flights to the North Pole were a mix of secret reconnaissance and publicized scientific missions. Their unclassified trips were covered in *Popular Mechanics* in 1948. Besides disguising ELINT operations, weather reconnaissance and its ground-based relations assisted the development of the Alaskan weather forecasting apparatus.[248]

"The logistics function," historian Kathy Price wrote, "while it lacked glamour, was critical to the operation of the air defense system as a whole." The 5001st Composite Wing was responsible for Ladd's logistical operations, including maintenance of all facilities north of the Alaska Range, from 1952 on. Airlift was the primary method for sustaining all the peripheral Alaskan facilities, seconded by the annual Cool Barge run to the Bering Sea.[249] Ladd sustained the Aircraft Control and Warning sites, Galena FOB, the White Alice Communications Network and the northern and western segments of the DEW Line.[250] Ladd's 5001st Composite Wing and 10th Air Rescue Squadron also assisted in ice island operations, providing weekly C-47 flights to T-3.[251]

Cold weather testing at Ladd continued well into the Cold War.[252] Ladd was the Air Force's secondary cold weather station, after Eglin AFB in Florida. The Cold Weather Test Detachment conducted 19 separate assignments in 1947 alone.[253] The 5064th Cold Weather Materiel Testing Squadron and Arctic Aeromedical Laboratory performed the actual testing, under the auspices of 5001st Research and Development Group, formed in 1951.[254] Testing goals included developing standard operating procedures for arctic aircraft performance and maintenance, testing parts and fluids in extreme temperatures, and experiments with survival gear, clothing, communications equipment, ground support and medical issues.[255] The Air Force's Arctic Indoctrination School, or "Cool School," was transferred from Marks AFB at Nome to Ladd in 1950, where it stayed until October 1960.[256] Alongside the constant tests of aircraft durability and function in the cold, one of the more common cold weather tests was ice bombing, to observe how deeply a bomb would penetrate ice and determine appropriate bomb weights and fusing. Another test analyzed storage of napalm in arctic conditions.[257]

The Arctic Aeromedical Laboratory (AAL), operational from 1947to 1967, was part of the cold weather testing station. AAL's three departments were biochemistry, environmental medicine and physiology. Its duties were wide-ranging, from developing a photosynthetic gas exchange system used in space travel to conducting morale experiments. A controversial episode involved using radioactive Iodine-131 to test the thyroids of Alaska Natives and non-Native military subjects, without obtaining informed consent. AAL sought (and failed to find) a correlation between thyroid function and tolerance to cold.[258]

***Ladd 6**

Ultimately, the story of cold weather testing at Ladd parallels that of other operations. In the mid-1950s, the Air Force gradually began to transfer operations to Eielson, citing inadequate facilities and a too-short runway to

[248] Price,16–17.
[249] Price, 22.
[250] Price, 9.
[251] Price, 30.
[252] AAC History, 1945–47, 82.
[253] AAC History 1945–47, 101.
[254] Price, 26.
[255] Price, *The World War II Heritage of Ladd Field*, 7–8.
[256] AAC History, 1 January-30 June 1950, 28.
[257] AAC History, 1 January-30 June 1950, 54, 57.
[258] Shanks and Grayburn, 32–34.

handle the increasingly heavy aircraft tested by the 5064th Cold Weather Material Testing Station at Ladd.[259] AAL survived to 1967 when it was transferred with its records to Brooks AFB, Texas.[260]

The U.S. Army also maintained a substantial presence at Ladd throughout its existence. Elements of the 4th Infantry Regiment protected Ladd from 1940 and were joined in 1948 by 2nd Infantry Regiment troops.[261] The Army's initial mission was to defend Ladd from ground and air attack, necessitating that the troops at Ladd be primarily infantry and anti-aircraft artillery (AAA). The 9th Infantry Regiment replaced the 4th in 1956. The 4th Infantry Anti-Aircraft Group remained at Ladd until 1958, operating eight anti-aircraft artillery sites (five off-post). The introduction of the NIKE surface-to-air missile rendered the 4th AAG's guns obsolete. Five NIKE sites operated by USARAL's 2nd Missile Battalion, 562nd Artillery, replaced the entire unit in 1959[262] The 4th Infantry also conducted a school designed to train USAF officers in infantry tactics, chemical and radiological warfare techniques.[263]

***Ladd 7**

The importance of Ladd's missions dwindled following the critical year 1957– the year of *Sputnik I* and the launch of the first Soviet ICBM. The defense net Ladd husbanded became increasingly obsolete, as satellite communications and surveillance and missile technology evolved. There were also practical concerns. Ladd's 9,200-foot runway was insufficient to the Air Force's needs and could not be lengthened due to geography. The base was also too close to Fairbanks for easy expansion. The budgetary restrictions of the late 1950s sealed Ladd's fate. It was condemned in September 1959, and its closure kept secret until mid-1960. On 1 January 1961, Ladd Air Force Base was renamed Fort Jonathan Wainwright and turned over to the U.S. Army.[264]

Eielson Air Force Base, 1944-Present

Eielson Air Force Base began modestly, as a World War II annex to Ladd Field near Fairbanks. Opened in late 1943 as Mile 26 (for its eponymous milepost on the Richardson Highway), the base served initially as an alternate landing site for Lend-Lease planes on their way to the Soviet Union by way of Ladd. Its Cold War purposes would be very different.

***Eielson 1**

Initial construction began in August 1943 and was completed by October 1944. The then-600-acre base boasted a 10-bed dispensary, an operations building, housing for 108 officers and 330 enlisted men, and two parallel runways, 165 feet wide by 6,625 feet long. Total initial construction cost approximately $8 million.[265] Briefly closed following World War II, in October 1947, Mile 26 fell under Alaskan Air Command control and was inaugurated as an independent installation on 13 January 1948.[266] Its primary missions were listed as support for arctic training and operations, and base defense. Eielson Air Force Base was so dubbed in honor of Army Air Corps Lieutenant Carl Ben Eielson, a pioneer of Alaskan and Arctic aviation killed in November 1929 as he flew to the aid of a ship frozen in the ice of the Northeast Passage.[267] No sooner had Eielson been christened

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[259] AAC History, July-December 1955, 82.
[260] Price, *Northern Defenders*, 26.
[261] Price, *The World War II Heritage of Ladd Field*, 51.
[262] *The Cold War Historic Context of Fort Wainwright and Ladd Air Force Base, 1946–1991*. Anchorage, AK: CH2M Hill, Inc., and Northern Land Use Research, Inc., July 2007, 3–4.
[263] AAC History, 1 July-31 December 1950, 24.
[264] Price, *Northern Defenders*, 34.
[265] Fact Sheet, History of the 354th Fighter Wing. http://www.eielson.af.mil/library/factsheets/index.asp. Accessed June 2012.
[266] Cloe, *Top Cover for America*, 160.
[267] "Memorials." *Science*, New Series 72, Nov. 1866 (Oct. 3, 1930), 332.

than work began to expand its facilities. In anticipation of the needs of SAC bombers and WB-29 reconnaissance aircraft, the Air Force lengthened the runways to 10,000 feet and built a railroad spur from Ladd AFB. Most notably in the 1950s, the Air Force built the "Thunderdome," a 60,000-square-foot, barrel-shaped hangar designed for the B-36 and the largest hangar in Alaska when it was constructed in 1954.[268]

***Eielson 2**

During the Cold War, the erstwhile Lend-Lease Eielson AFB served as a base of operations for intelligence-gathering and electronic eavesdropping activities.[269] Eielson, along with its neighbor Ladd, fielded numerous expeditions to collect air samples from Soviet airspace. An Eielson flight returning to Alaska from Japan had the dubious honor of detecting the first Soviet nuclear blast on 1 September 1949.[270] From 1949 until 1955, the 46th/72nd Reconnaissance Squadron—an organization made famous by the first extended long-range flight over the geographic North Pole and the development of modern polar navigation—served at Eielson.[271] Eielson reconnaissance flights also assisted the Air Force's early ice island operations.[272] Support for the base's various duties was provided by the 5010th Air Base Wing 1949–1981, until that organization was replaced by the 343d Composite (Tactical Fighter, after 1984) Wing, leading to the tenure of the 354th Fighter Wing, Eielson's current "host unit."[273]

Eielson's other prominent mission was as a launch platform and arctic training station for the Strategic Air Command's nuclear bomber fleet. The Alaskan Air Command historian noted in 1957 that for several years Eielson had been "primarily reserved for bomber activity."[274] The Joint Emergency War Plan of 1947 directed that SAC bombers be stationed in Alaska, oriented toward Soviet targets.[275] SAC chose Mile 26, and, in 1948, the runway was lengthened to its current span of 14,507 feet—the longest runway in North America at the time.[276]

While the first nuclear-equipped bombers at Eielson were B-50As rotated to Eielson in 1948,[277] the runway extension was necessary to accommodate America's new heavy bomber. The B-36 Peacemaker never saw action against any target and personified the philosophy of "massive retaliation." Designed in early World War II as a bomber capable of trans-oceanic attacks, the Peacemaker, in service 1948–1959, had a wingspan of 230 feet, 90 feet longer than its B-29 Superfortress predecessor. At 205 tons (loaded), it was nearly four times heavier than the B-29 and could carry 43 tons of conventional or nuclear bombs. In order to get its ponderous frame, ordnance and crew of 15 off the ground to a target 4,300 miles away and back, the B-36 had four General Electric turbojet engines and six air-cooled radial engines.[278] In 1948, Eielson AFB was one of only four air installations on American soil with a runway long enough to launch the Peacemaker.[279]

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[268] Mighetto and Homstad, 16.
[269] From its inception, Eielson AFB had a major polar geophysical mapping, intelligence and reconnaissance role. A WB-29 based at Eielson discovered the first evidence of Soviet atomic testing in 1949. Eielson took part in the Ferret flights over Russia from the 1950s into the 1970s, and Rivet, Cobra Ball and U-2 flights beginning in the 1960s.
[270] Denfeld, *The Cold War in Alaska*, 115; Price, *Northern Defenders*, 17.
[271] White, *World in Peril*, 67; Shanks and Grayburn, 14.
[272] Shanks and Grayburn, 16.
[273] Fact Sheet, 354th Fighter Wing.
[274] AAC History, July-December 1957, 47.
[275] Denfeld, *The Cold War in Alaska*, 15.
[276] The subject of runway length is apparently up for some debate: William J. Siedler, this work's original author, listed the figure as 14,520 feet. Air Force historian John Cloe's *Top Cover for America* cites 14,518 (160), as does Colt Denfeld of the US Army Corps of Engineers in his *The Cold War in Alaska: A Management Plan for Cultural Resources* (15). This author has chosen the Air Force Fact Sheet's "official" length, 14,507. Fact Sheet, Eielson Air Force Base, http://www.eielson.af.mil/library/factsheets/index.asp. Accessed June 2012.
[277] Denfeld, *The Cold War in Alaska*, 16.
[278] Fact Sheet, Convair B-36J Peacemaker, http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=360. Accessed June 2012.
[279] Denfeld, *The Cold War in Alaska*, 16.

***Eielson 3**

The peak of SAC activity occurred at Eielson in the mid-1950s. At least six SAC exercises of bomber, fighter, tanker and reconnaissance aircraft and crews occurred in 1955 alone. They included Operation Snowbird in January, Operation Sea Blast from May through September, and Operation Steam Shovel in October. In 1957, Eielson participated in operation Reflex Action, in which SAC rotated bombers to Eielson and other forward bases for short but maximum alerts of 10-14 days. During these tours, one third of the bombers were always on full alert for 72-hour periods, fully loaded with nuclear ordinance. While SAC experimented with the F-84F Thunderstreak fighter aircraft, Eielson would continue its role as a long-range offensive base well into the 1960s. In 1957, Eielson received the Air Force's next heavy bomber, the B-47 Stratojet, with the 97th Bomb Wing.[280] Like the B-36 it replaced, the all-jet-powered B-47 was a Cold War-only bomber. The most bombing action a B-47 at Eielson saw was an overnight flight to Washington, D.C. on June 30–31, 1958, with 1,600 copies of the *Fairbanks Daily News-Miner*'s Progress Edition, heralding the new era of Alaska statehood.[281]

SAC so dominated Eielson during the 1950s that the Alaskan Air Command proposed it step aside and officially make Eielson a SAC base. Despite its virtual monopoly over Eielson AFB's operations, SAC preferred to leave actual base operation to the Alaskan Air Command, citing among other issues Eielson's purported lack of POL capability to support full SAC operations.[282]

Eielson's role increased as its neighbor Ladd's diminished. By the late 1950s, the Air Force had transferred many of Ladd's functions to Eielson.[283] Cold weather testing was named a joint duty for Ladd and Eielson in 1955, with all operations to be moved to Eielson as soon as expeditious.[284] On January 1, 1961, the Air Force transferred Ladd AFB to the Army and it was renamed Fort Wainwright. Eielson assumed command of cold weather testing of aircraft and equipment. The Air Force Arctic Survival School, Cool School, moved to Eielson from Ladd in October 1960.

***Eielson 4**

Though Eielson was the sole remaining full-size Air Force base north of the Alaska Range, its time on the frontlines of the nuclear bomber "war" was drawing to a close. The last B-47s were reassigned by 1963. Refueling tankers replaced the bombers. Eielson became a dispersal and post-strike SAC facility, whose primary aircraft were the KC-135 aerial refueling tankers of the 4157th Strategic Wing. Eielson was also responsible for an important Air Force training area. Throughout the 1950s and 1960s, SAC and AAC trained at the Blair Lakes Range just west of Eielson, though the commands disagreed over its utility.[285] Eielson's role in facilitating training would increase in importance as the Cold War progressed and even after its passing.

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[280] AAC History, July-December 1957, 52.
[281] Cole, 232.
[282] AAC History, July-December 1957, 52–54.
[283] Price, *The World War II Heritage of Ladd Field*, 8.
[284] AAC History, July-December 1955.
[285] The commands' differing opinions reflect some tension within the Air Force structure, already hinted at by AAC's attempt to second Eielson to SAC. AAC had no complaints with the important range facility, which first Ladd, then Eielson, had been responsible for since its inception in 1941. SAC, on the other hand, felt the range to be totally inadequate, as it failed to provide for high angle strafing, had no skip bomb or rocket targets, and was unacceptable for strafing in general due to a lack of suitable backdrop. AAC's arguments to the counter consisted of observations that permafrost was too expensive to build on, and more importantly, "AAC had not received a formal request from SAC for such improvements." AAC History, July-December 1956, 83; "Part of Blair Lakes Training Briefing." n.d., ca. 1975. Elmendorf History Office, Drawer 11. Folder: Correspondence, Blair Lakes Range.

By the end of the Cold War, Eielson's missions included reconnaissance and cold weather testing, tactical air support and training, aerial refueling, and fighter interceptor duties. Eielson's longstanding role as a host for training exercises has expanded to include serving as the home of the annual multinational Cope Thunder exercise, inaugurated in Alaska in 1992. Cope Thunder, renamed RED FLAG-Alaska in 1996, is described as "a series of Pacific Air Forces commander-directed field training exercises for U.S. forces [which] provides joint offensive counter-air, interdiction, close air support, and large force employment training in a simulated combat environment."[286] Further defined as a chance for American forces to train on a large scale with Allied air forces, RED FLAG-Alaska features major American and foreign participation, including up to 2,500 personnel, and can involve Army and Navy units as well. Notable participants include the Japan Air Self-Defense Force and the German *Luftwaffe*.[287] In 1994, Eielson hosted a search and rescue exercise, SAREX 94, conducted jointly with Canada and the former foe, the newly constituted Russian Federation.[288]

***Eielson 5**

In 2012, Eielson's units were the hosting 354th Fighter Wing, accompanied by the Alaska Air National Guard's 168th Air Refueling Wing, which continued the old SAC mission by operating KC-135 Stratotankers. The 353rd Combat Training Squadron hosted Pacific Air Forces' RED FLAG-Alaska, Alaska Command's Northern Edge, Pacific Command's Cooperative Thunder, and numerous other exercises including those involving the Joint Pacific Alaska Range Complex. Detachment 1, 66th Training Squadron, or "Cool School," trained armed services personnel in arctic survival. Detachment 1, 210th Rescue Squadron, supported two Pave Hawk helicopters on loan from Kulis Air National Guard Base in Anchorage and conducted search-and-rescue services north of the Alaska Range. Air Force Office of Special Investigations Detachment 632 investigated criminal activities and performed counterintelligence. Lastly, Detachment 460, Air Force Technical Applications Center, operated the largest and northernmost of the United States Atomic Energy Detection Center's networks.

In its present incarnation, Eielson is a major Air Force installation with a combined headquarters, residential and training area covering 63,195 acres.[289] Its population comprises approximately 2,500 military personnel, of whom perhaps 340 are Air National Guard members. Over 2,000 personnel, including families, live in Eielson's 930 houses and 387 dorm rooms, with another 1,100 off base. 480 civilian employees round out the population. Eielson has a major economic impact on the Fairbanks area, with a $132 million military payroll and over $79 million spent on construction in 2011 alone.[290]

The years following the end of the 20th century suggest Eielson's future is increasingly in doubt. When journalist Harry Kursh declared in 1961 that "there is not the slightest chance that defense in Alaska will again be fed to wolves crying "Economize!" he did not foresee the demands of an economy in recession and the Global War on Terror.[291] A 2005 Base Realignment and Closure (BRAC) Commission recommended the reassignment of all Eielson aircraft, excepting the Air National Guard's KC-135 Stratotankers, and suggested the base be placed in "warm," or caretaker, status. To date, only the 355th Fighter Squadron with its A-10 Thunderbolt ground-attack aircraft has been reassigned, to Barksdale AFB, Louisiana.[292] In 2012, the Air Force

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[286] Eielson Air Force Base, Red Flag-Alaska. http://www.eielson.af.mil/library/redflag-alaska.asp. Accessed June 2012.
[287] Friedman, Sam. "Red Flag Alaska Exercise Ramps Up at Eielson Air Force Base." *Fairbanks Daily News-Miner*, 12 June 2012, http://newsminer.com/view/full_story/18965345/article-Red-Flag-exercises-ramps-up-at-Eielson-Air-Force-Base?instance=home_news_window_left_top_1. Accessed June 2012.
[288] Fact Sheet, 354th Fighter Wing.
[289] Fact Sheet, Eielson Facts and Figures, http://www.eielson.af.mil/library/factsheets/index.asp. Accessed June 2012.
[290] Fact Sheet, Eielson Facts and Figures.
[291] Kursh, 218.
[292] Eielson Air Force Base Infrastructure Development in Support of RED FLAG-Alaska Environmental Assessment. Eielson AFB, Alaska, 2007, 1-1, 1-4. http://www.eielson.af.mil/shared/media/document/AFD-070815-028.pdf. Accessed June 2012.

declared its intention to remove Eielson's 18th Aggressor Squadron (F-16 Fighting Falcon multi-role fighters) from Eielson to Elmendorf.[293]

Forward Operating Bases, 1948–1989

Forward Operating Bases (FOBs) extended the reach of the U.S. Air Defense Command's ability to intercept airborne intruders. Acting as satellites to the main bases at Ladd (later supplanted by Eielson) and Elmendorf, the FOBs provided on-the-spot fighter aircraft, whose mission was the protection and patrol of American airspace near the Soviet Union. Alaska's two largest FOBs, Galena and King Salmon, served as key interceptor bases during the 1950s and 1960s– the height of the Cold War and the Soviet bomber threat. The Alaskan FOBs intercepted more Soviet aircraft than any other base. Like the DEW Line and the Nike sites, the FOBs' importance decreased markedly as the development of ICBMs rendered massive bomber attack obsolete.[294] However, though their staffing continually dwindled, Galena and King Salmon performed their interception mission throughout the Cold War.

*** FOB 1**

Part of the attraction of Galena and King Salmon to the Alaskan Command was their location, within good intercept and resupply distance. While the Alaskan Air Command had inherited Marks AFB (formerly Marks Army Airfield) at Nome, the leadership decided no later than 1948 that Marks was out of easy resupply distance and too close to the Soviets. The AAC historian observed in 1956 that "no installation in Alaska, with the possible exception of Point Barrow, had been in and out of military history as frequently as Nome Field," and characterized the command's interest in Marks as "usually fleeting."[295] AAC employed Marks as a FOB for only three years, 1948–1951. AAC chose instead to invest resources in two other World War II airfields, Galena and King Salmon.[296] King Salmon, known as Naknek Field until 1954, became a FOB in 1948 when the Air Force sent F-80 Shooting Stars, then America's first front-line jet fighter, there. In March 1951, the Air Force sent four F-94 Starfires to Galena for intercept duty. Marks AFB closed—temporarily at first, then for good in December 1956. Its only remaining building is the gym, now used by a contractor.[297]

*** FOB 2**
*** FOB 3**

From the outset, the Air Force struggled to field competent interceptors in Alaska. The F-80 and F-94 planes initially programmed were ill suited to the interception role, being short-range and badly equipped for poor or cold weather. Constant supply problems exacerbated the aircraft's flaws. By 1950, the F-80s were gone. Advancements in all-weather interceptor technology led to the replacement of the F-94s which were not well received due to their status as[298] transitional fighters with no de-icing capabilities, with the bigger, heavier twin-

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[293] "Murkowski, Begich Fighting F-16 Aggressor Squadron Move from Eielson to Elmendorf, 4 C-130 Retirements at Elmendorf." *Alaska Business Monthly*, February 2012, http://www.akbizmag.com/Alaska-Business-Monthly/February-2012/Murkowski-Begich-Fighting-F-16-Aggressor-Squadron-Move-from-Eielson-to-Elmendorf-4-C-130-Retirements-at-Elmendorf/. Accessed June 2012.
[294] Whorton, Mandy, Gustavious Williams, and Alan M. Alpert. *History of Alaska's Forward Operating Bases (FOBs): The Soviet Bomber Threat and North American Air Defenses during the Cold War*. Argonne, IL: Environmental Assessment Division, Argonne National Laboratory, April 2001, 8.
[295] AAC History, 1 July-31 December 1956, 86.
[296] Whorton et al, 7; Cloe, *Top Cover and Global Engagement*, 16.
[297] Williams, James W. *History of the Military Airfield at Nome, Alaska*. Tustin, CA, March 1999, 46.
[298] AAC History, 1 January–30 June, 1951, 3; AAC History, Jan-July 1952, 71. Complicated, difficult to operate and plagued by problems, the F-94 was decreed "inferior to the F-80" and by the Alaskan Air Command, which was nonetheless saddled with it for years after having labeled it "designed at best as an interim aircraft". See Alaskan Air Command histories for 1951 and 1952 for in-depth explorations of the F-94 and its shortcomings.

engine Northrop F-89 Scorpion. The F-89s began to arrive in 1953, with the F-94s gone by 1955.[299] At Galena, the new planes' arrival coincided with an ambitious program to pave and lengthen the runway and improve its lighting system. But the F-89, while a capable all-weather aircraft, was slow, fuel-inefficient, and expensive. Its range, although better than the F-94, was barely adequate.

*** FOB 4**

In the late 1950s, as the Alaskan Air Command policy shifted to what it termed "more firepower, less expenditure," the Air Force assigned supersonic high-ceiling fighters, the delta-winged F-102s and 106s, to the Alaska FOBs.[300] The Convair F-102 Delta Dagger and F-106 Delta Dart could at last overtake a Soviet intruder. The all-missile armament of these planes included up to six state-of-the-art Falcon air-to-air missiles. Both planes also could carry the USAF's first tactical nuclear air-to-air missile, the AIM-26 Genie.

After 1957, the focal point for the intercept duties assigned to FOBs was the Combat Alert Cell (CAC). The CAC was the hub of activity at a base. Also known as the ready hanger, the CAC answered the need to get airborne quickly, prepared to meet the Soviet threat. Its design is unique to Cold War military construction. The typical CAC is a combination aircraft hangar, maintenance facility, and refueling depot, with a self-contained living area for the pilots on the second floor.

When radar detected an unidentified aircraft in Alaskan airspace, the intruder's location and direction would be radioed to an Air Defense Direction Center such as Campion or King Salmon. The station would transmit the information to the nearest FOB. Minutes later, planes were in the air to challenge the intruders. Swift response time was essential. The Soviet planes could be as far away as the Polar Basin or the North Pacific, and the faster Air Force fighters were in the air, the farther out the Soviet aircraft could be intercepted.[301]

By the 1960s, fear of Soviet bombers was eclipsed by fear of Soviet missiles. ICBM detection now had priority, resulting in the opening of the BMEWS at Clear in 1961. During the 1960s, however, there was increased frequency of interceptions for Alaska's FOBs. The first visual intercept of Soviet aircraft (two TU-16 Badgers) took place in 1961 above the Bering Sea.[302] The two American interceptors were F-102s of the 317th Fighter Interceptor Squadron from Galena FOB.

Crews from Galena made 15 more intercepts before 1968 and from King Salmon, eight. Galena had 197 intercepts of Soviet aircraft between 1961 and 1991, the most for any U.S. base during the Cold War. Fighters from King Salmon tallied 69 intercepts.[303] The frequency of intercepts increased dramatically in the 1970s, a result of the deployment of the F-4E Phantom II. The Phantom, a versatile fighter-bomber widely used in Vietnam, had great range, speed, ceiling and durability, and on-board radar.[304]

Both FOBs received the McDonnell-Douglas F-15A Eagle multi-role fighter in 1982. Complemented by two E-3 Sentry Aircraft Warning and Control System (AWACS) planes assigned to Elmendorf in 1986, annual intercepts reached an all-time high. In 1987, Alaska's intercept tally was 33.[305] The mission was more crucial than ever, as the Soviets deployed the Tu-95 Bear H—capable of nuclear cruise missile launch—in 1984 and

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[299] Whorton et al., 9.
[300] AAC History, July-December 1955, 14.
[301] *Defending Attack from the North: Alaska's Forward Operating Bases During the Cold War*. Argonne, IL and Anchorage, AK: Argonne National Laboratory and 611th Civil Engineer Squadron, n.d., 8.
[302] *Defending Attack from the North*, 8.
[303] Whorton et al, 10–11.
[304] *Defending Attack from the North*, 6–7.
[305] Allen, TSgt William J. *Hunting the Soviet Bear: A study of Soviet Aircraft Intercepts near Alaska 1961–1991*. Elmendorf AFB, AK: Eleventh Air Force Office of History, Headquarters Eleventh Air Force, 1992, 73.

conducted training missions in the Arctic.[306] Intercepts continued past the Cold War, into the 1990s. The last intercept took place November 5, 1994.[307]

***FOB 5**

After the end of the Cold War, as a result of the reduced air threat to North America and the overall reductions in the Department of Defense budgets, the Air Force placed Galena and King Salmon FOBs in caretaker status. All permanent military personnel and aircraft left Galena in October 1993. King Salmon was closed in 1994. Its airport was converted to a civilian-maintained contingency field. The only military presence remaining was the old AC&W radar station, converted in 1983 to Minimally Attended Radar (MAR) and left operating.[308]

The facilities at Galena and King Salmon date to World War II, but have been updated significantly in the intervening years. In the 1980s alone, the Air Force constructed 17 new buildings at Galena and renovated numerous others. King Salmon languished, with few updates after it was made headquarters for the southern sector AC&W stations in 1969. In 1998 the Air Force and the Alaska State Historic Preservation Officer determined that both FOBs were eligible for inclusion in the National Register of Historic Places. Galena's historic district comprises 20 buildings dating from the 1950s to the 1980s. King Salmon's 11 buildings date from the late 1940s and 1950s.[309] Like most Alaskan Cold War sites, Galena and King Salmon have impacted their environment. As of 2008, the Air Force was conducting cleanup operations at both former bases.[310]

Shemya Air Force Base/Eareckson Air Force Station, 1943–1995

Shemya Air Force Base, now Eareckson Air Station, was founded in 1943. Located just east of Attu at the far end of the Aleutian chain, it was a minor intercept base, a stopover for international flights, and an important link in the Cold War intelligence net. The Cobra Dane radar facility on the island is discussed in the "Detect and Monitor" segment of this document.

***Shemya 1**

While the Army fought Japanese soldiers on Attu Island in May 1943, Alaskan scouts and the 4th Infantry Regiment surveyed nearby Shemya as an airfield site. By the end of June Shemya had an operating airstrip made of pierced steel planking. For the remainder of the war, Alaska's farthest-west air base hosted the Army Air Force 404th Bombardment Squadron, which bombed Japan's Kurile Islands. The Navy used it for PBY flying boats and land-based Ventura bombers.[311] Shemya was briefly considered as a jumping-off point to invade Japan.[312] When the war ended, Shemya had a 10,000-foot concrete runway capable of accommodating B-29s, though only one landed there on 11 May 1945.

***Shemya 2**

[306] Cloe, *Top Cover and Global Engagement*, 24.
[307] Cloe, 25.
[308] *Defending Attack from the North*, 11.
[309] Whorton et al, 33.
[310] Alaska Department of Environmental Conservation, Spill Control and Response, SPAR Programs, http://dec.alaska.gov/spar/csp/sites/kingsalmon.htm. Accessed July 2012.
[311] Garfield, 341.
[312] Garfield, 338.

Superfluous to the heartland defense concept ALCOM adopted in the Cold War, all Aleutian bases closed after World War II except for Adak Naval Station and Shemya Air Force Station.[313] Shemya served as a fighter base and a refueling point for planes flying the Great Circle route to Asia. For the first few years of the Cold War, Shemya made do with World War II-era facilities. It was slated for minimum operations preparatory to closure in 1949. The Korean War briefly revived the outpost's importance, and AAC ordered some rehabilitation in 1952.[314] Shemya's position on the Great Circle route ultimately saved it when AAC planned on abandoning it in favor of Thornbrough AFB at Cold Bay.[315] The potential loss of a refueling stop on the northern Great Circle route caused a furor in Washington, prompting Senator Warren Magnuson and the Senate Appropriations Committee to order Shemya kept open. Despite the Senate's instructions and Washington Representative Thomas Pelly's dire warning that abandoning Shemya was equivalent to abandoning Hawaii, the Air Force briefly left in 1954.[316] In a concession to Congress' concerns, they leased the airfield to Northwest Orient Airlines (NOA). NOA remained until 1961, three years after the Air Force revived Shemya AFS as an intelligence and interceptor base.[317] Shemya was considered important enough to receive a White Alice station through Project Bluegrass, assuring reliable communications with AAC.[318] The first of Shemya's post-1958 missions was weather reconnaissance, but Shemya was soon pressed into service as a refueling point for the B-52s and KC-135s of Operation Chrome Dome. Chrome Dome was a 1960 SAC initiative wherein B-52s flew just outside Soviet airspace, equipped with nuclear weapons. Tankers, fueled at Shemya, would meet the SAC bombers and refuel them in the air. The first of Shemya's radar stations, an AN/FPS-17 Detection Radar, started operating in May 1960 and later was joined by an AN/FPS-80 Tracking Radar. Both systems were deactivated upon the completion of Cobra Dane in July 1977.[319] In 1968, Shemya was renamed an Air Force base.[320]

As an intercept base, Shemya languished from World War II until after Vietnam. In November 1977, for the first time since the 1940s, the Air Force dispatched fighters to Shemya. Four F-4Es were sent to test forward deployment capabilities to Aleutian bases. The deployment was a success. On 28 April 1982, two F-15s temporarily based at Shemya intercepted two Soviet Tu-95 Bear bombers. An Ilyushin Il-20 was the last Soviet aircraft intercepted from Shemya on 2 October 1989.[321]

***Shemya 3**

Intelligence was Shemya's primary focus from 1958 on. The Air Force Security Service (AFSS) and Army Security Agency performed intelligence duties at Shemya throughout the 1960s and 1970s. The Army left in 1975, but AFSS remained active through the 1980s. Spy flights routinely left from Shemya, starting in the late 1960s. Cobra Ball was a series of USAF missions flown from Eielson and Shemya until the end of the Cold War, using RC-135 aircraft equipped with infrared sensors to detect nuclear missile launches and impact areas.[322] The 1983 tragedy of KAL 007, a South Korean airliner shot down by the Soviet Air Force, briefly put Shemya in the public eye. The Air Force's spy flights from Shemya were briefly associated with the KAL 007 incident.[323]

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[313] Cloe, "The Legacy of War," in Chandonnet, Fern (ed.). *Alaska at War, 1941–1945: The Forgotten War Remembered*. Fairbanks, AK: University of Alaska Press, 2008, 393–398, 397.
[314] AAC History, Jan.-June 1952.
[315] Cloe, *Top Cover for America*, 159.
[316] AAC History, Jan.-June 1954, 16–18.
[317] Cloe, *Top Cover for America*, 172.
[318] ALCOM History, 1961, 3.
[319] "Chronology: The Air Force in Alaska." Office of History, Elmendorf AFB.
[320] Proposed Plan for Remedial Action at the Eareckson AS, Alaska. 611th Civil Engineer Squadron, Elmendorf AFB, 2002. http://dec.alaska.gov/spar/csp/docs/western/ea_pp_02.pdf, accessed July 2012.
[321] "Chronology: The Air Force in Alaska."
[322] "Intelligence: Cobra Ball." http://www.globalsecurity.org/intell/systems/cobra_ball.htm. Accessed June 2012.
[323] Kolb, Richard K., ed. *Cold War Clashes: Confronting Communism, 1945–1991*. Kansas City, MO: VFW Publications, 117.

***Shemya 4**

Over the years, Shemya hosted several support units, under the control of the Alaskan Air Command/11th Air Force at Elmendorf. The 5021st Air Base Squadron (AAC) operated the Base during the Korean War until Shemya AFS was closed in 1954. In 1958, the 5040th Air Base Squadron replaced the 5021st. Then in 1962, the 5040th Air Base Squadron was redesignated the 5073rd. As Shemya became an Air Force base with more activities, the 5073rd's duties grew, and it was made an Air Base Group in 1974. In 1975, a squadron of Eielson AFB's 5010th Air Base Group also served at Shemya.[324] The 5073rd saw Shemya through the Cold War's end, being renamed the 673rd Air Base Group.

Struggle against the elements is a constant theme of Alaskan military operations. Nicknamed "The Rock" and "The Black Pearl," the flat, 2.25x4.5-mile atoll of Shemya is subject to high, salt-laden winds that corrode man-made materials and can gust up to 140 miles per hour. The challenge at Shemya was to create, as historians Lisa Mighetto and Carla Homstad put it, "comfortable, safe, and humane living conditions in a landscape that had none of these qualities."[325] The weather, isolation, and short runway all conspired to make Shemya a dangerous place for air operations. The Alaskan Air Command banned nighttime or bad weather flights to Shemya in 1948, after a Ladd AFB B-29 of the 375th Recon Squadron (VLR) Weather crashed on the island.[326] Shemya took an especially heavy toll on Eielson AFB's 6th Strategic Reconnaissance Wing. In January 1969, an Eielson-based RC-135 crashed on the runway in what the Air Force termed a "Class A Flight Mishap." Miraculously, the crew was unhurt, but another 6th SRW RC-135 Wing was not so lucky. The plane crashed in the Bering Sea minutes after leaving Shemya, killing 19.[327] In 1981, an RC-135 crashed and killed six crewmembers while attempting to land.[328]

***Shemya 5**

Shemya is a mishmash of historic properties virtually covering the island. Four birchwood hangars were built in World War II. During the Cold War, their roofs were raised to house larger aircraft. Two hangars survived as of 1998. Permanent barracks replaced the World War II Quonset huts, and the only piece of remaining World War II heritage is a 90-mm anti-motor torpedo boat gun on display.[329] Other World War II structures were removed when the Air Force returned to Shemya in 1958. A photo from the early 1960s shows an abandoned runway in addition to the active airstrip, warehouses, petroleum storage tanks, a pre-Cobra Dane BMEWS-associated radar building, an Army Security Agency radome, and the White Alice billboard reflectors. The runway was damaged in an earthquake on 3 February 1965 but was soon repaired.[330] In 2002, the Air Force and the Alaska Department of Environmental Conservation designated six sites for cleanup.[331] The island is extensively contaminated by fuel and other chemical spills, and remediation is underway.[332]

***Shemya 6**

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[324] ALCOM History, 1975.
[325] Mighetto and Homstad, 348, 352.
[326] AAC History, 1948, 82.
[327] "Guardians of the North: History of Mile 26 Airstrip and Eielson AFB." Eielson AFB, Office of History, http://www.eielson.af.mil/shared/media/document/AFD-080107-016.pdf. Accessed July 2012, 37–38.
[328] "Guardians of the North," 43.
[329] Denfeld, *The Cold War in Alaska*, 114.
[330] "Eareckson Air Station." http://www.globalsecurity.org/space/facility/shemya.htm. Accessed June 2012.
[331] Proposed Plan for Remedial Action at Eareckson AFS.
[332] Alaska Department of Environmental Conservation, Spill Protection and Response, Eareckson Air Station. http://dec.alaska.gov/spar/csp/sites/eareckson.htm. Accessed June 2012.

After the Cold War, as after World War II, the Air Force considered Shemya for closure. Its position on the Great Circle route was rendered obsolete by modern aircraft's extended range. Shemya AFB was renamed Eareckson AFB in 1993 after Colonel William O. Eareckson, Alaska's most memorable World War II aviator. On 1 April 1995, it was designated an air station and placed in caretaker status.[333] The Cobra Dane radar continues to operate, but the air station has slipped into the Cold War past. Yet it lives on in memory. In the words of Raytheon employee Herbert N. Cook,

I hope you've listened to this tale
And understood quite well;
When someone mentions Shemya
Tell him to go to hell.[334]

***Shemya 7**

Guard and Defend

The Navy in Alaska

Alaskan naval operations date to Alaska's purchase from Russia in 1867. Indeed, the Navy was the sole government from 1897 until the First Organic Act of 1884.[335] Following the Russian pattern, Alaskan naval operations were based at Sitka and Kodiak until World War II. The Navy was Alaska's primary defense against an attack.[336] Almost entirely undeveloped until the late 1930s, Alaska's naval infrastructure dates almost entirely from World War II and the Cold War. The Alaskan Naval Sector, established in 1941, was commanded from Kodiak and was subordinate to the 13th Naval District in Seattle.[337] The Alaskan Sea Frontier, also known as the 17th Naval District and inaugurated in 1944, was likewise based at Kodiak until 1971, with a brief hiatus from 1943 to 1945. During that window, and again from 1971 until its closure, Adak served as headquarters for naval operations in Alaska.

The Alaskan Sea Frontier was tasked with defending Alaska's sea approaches and protecting its sea lines of communications. Its primary activities were aerial reconnaissance, training and logistical support.[338] It was also the service tasked with emergency defense of Alaska. In the event of a nuclear strike that took out ALCOM headquarters, Commander Alaskan Sea Frontier (COMAL SEAFRON) would assume command of ALCOM.[339] Following the disestablishment of the Alaskan Sea Frontier, the Navy continued its intelligence and antisubmarine operations from Adak until the end of the Cold War.

Naval Operating Base Kodiak, 1939–1971

Kodiak, headquarters of the U.S. Navy's Alaskan Sector during World War II, was the command post for defense and sea patrols in the early Cold War. It was turned over to the U.S. Coast Guard in 1971.[340] The

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[333] Fact Sheet, Military History in Alaska, 1867–2000, http://www.jber.af.mil/library/factsheets/factsheet.asp?id=5304. Accessed June 2012.
[334] Cook, Herbert N. *Shemya Island*. Ardmore, PA: Dorrance & Company, 1980, 1.
[335] ALCOM History, 1947, ii.
[336] Mighetto and Homstad, 98.
[337] Whitman, Edward C. *The Forgotten War: U.S. Submarine Operations in the Aleutians in World War II*. United States Navy. http://www.navy.mil/navydata/cno/n87/usw/issue_18/forgotten.htm. Accessed July 2012.
[338] ALCOM History, 1970, 18.
[339] ALCOM History, 1968.
[340] Hummel, *Alaska's Militarized Landscape*, 100.

Hepburn Board, a Navy-appointed group tasked in 1938 with evaluating U.S. defenses, recommended its establishment. The Navy started large bases on Kodiak, Sitka and Dutch Harbor the following year.[341]

***Kodiak 1**

Kodiak was the Navy's primary full-service Alaskan port. As designed, Naval Operating Base Kodiak had a naval air station, a submarine base, a net depot, docks, a hospital, fuel and ammunition storage, provisioning, personnel, and administration. The air station could accommodate land and sea planes, and the submarine base could repair small ships. Additional defense funding meant that, by 1941, Kodiak had an aircraft warning system, harbor defenses, air station, and submarine base.[342] Three paved runways, each 150 feet wide, were of 6,000, 5,400, and 5,000-foot lengths. The seaplane facility at Women's Bay had three seaplane ramps, two permanent hangars, and a 200,000-square-foot maintenance hangar. An 800-foot cargo pier and a 450-foot tender pier were built for large ship docking, along with 13 small piers. Submarines could be accommodated by a floating drydock, while surface ship facilities included a 175-ton marine railway, 348 feet long. Surface storage tanks could hold nearly three million gallons of various fuels, with another two million underground.[343]

***Kodiak 2**

Starting in 1942, Kodiak-based aircraft flew bombing missions to Japanese-held Kiska in the Aleutians, submarines harried enemy shipping, and the base funneled supplies to the Alaska Peninsula and Aleutian chain.[344] Naval Operating Base Kodiak was command headquarters for joint Army-Navy operations, until the command transferred to Adak in March 1943. The submarine base was decommissioned in 1945, along with the net defense site on Woody Island.[345] At the end of World War II, Kodiak was one of only eight Pacific bases retained by the U.S. Navy. Little construction was undertaken throughout the postwar period until after the Coast Guard takeover.[346] The base's location, however, fit well with ALCOM's "heartland" defense concept. Naval Station Kodiak was established on 23 September 1947. Naval Operating Base Kodiak was the overall administrative command, comprising the U.S. Naval Air Station, the U.S. Naval Station and the Marine Barracks.[347] Day-to-day missions for Naval Operating Base Kodiak components included exercise support and numerous search and rescue missions.[348] An ice reconnaissance survey, Exercise BAREX (Point Barrow Resupply Expedition), occupied NAS Kodiak during the early 1950s, along with search and rescue operations.[349] During the Korean War, Kodiak received sufficient extra personnel to warrant construction of 56 new housing units.[350]

***Kodiak 3**

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[341] Mighetto and Homstad, 26.
[342] Mighetto and Homstad, 46, 62, 100.
[343] Bureau of Yards and Docks. *Building the Navy's Bases in World War II: History of the Bureau of Yards and Docks and the Civil Engineer Corps, 1940–1946, Vol. II*. Washington: United States Government Printing Office, 1947, 169–172, http://www.ibiblio.org/hyperwar/USN/Building_Bases/bases-23.html. Accessed July 2012.
[344] Mighetto and Homstad, 105.
[345] Consortium Library, Archives and Special Collections Department, "United States. Department of the Interior. National Park Service. Historic American Engineering Records. Naval Operating Base, Kodiak, Alaska. Report and Plan; 1940, 1984, http://consortiumlibrary.org/archives/CollectionsList/CollectionDescriptions/hmc-0287cd.html. Accessed July 2012.
[346] Denfeld, *The Cold War in Alaska*, 262.
[347] History of U.S. Naval Air Station, Kodiak, Alaska, 1 July-31 December 1947, 4, http://www.kadiak.org/navy/1947jul_sep.txt. Accessed July 2012.
[348] History of U.S. Naval Air Station, Kodiak, Alaska, 1 July-31 December 1951, 6, 7. http://www.kadiak.org/navy/1951jul_dec.txt. Accessed July 2012.
[349] History of U.S. Naval Air Station, Kodiak, Alaska, 1 July-31 December 1952, 7. http://www.kadiak.org/navy/1952jul_dec.txt. Accessed July 2012.
[350] History of U.S. Naval Air Station, Kodiak, Alaska, 1 July-31 December 1951, 9.

As the Soviet submarine threat grew, Kodiak received additional funding.[351] Notably absent was any kind of traditional naval force based at Kodiak. The base served intelligence, logistics, command and control missions until its closure.

Kodiak Naval Operating Base was designated a National Historic Landmark and included in the National Register of Historic Places in 1985, along with surrounding Army forts Greely and Abercrombie, which were erected to protect the naval installation.[352]

Naval Air Facility Adak/Naval Complex Adak, 1942–2000

The U.S. naval base on Adak is a relic of that brief window when fast carrier strikes and island hopping defined naval warfare. During World War II, the Alaska Defense Command established posts, airfields and ports on Adak as a headquarters for the Army and Navy forces to defeat the Japanese on Attu and Kiska.[353] Recommended by Rear Admiral Robert Theobald as a forward operating base and narrowly approved over Army objections, Adak was secured by American forces on 30 August 1942. Its airfield was built in ten days by the Army's 807th Engineers.[354] By March 1943, the Alaska Defense Command had moved its headquarters to Adak.[355] In 1944, following completion of the Aleutian Campaign, Adak became headquarters for the Alaskan Sea Frontier, or ALSEAFRON. Like Shemya, Adak was considered as a potential jumping-off point to invade Japan via the Kurile Islands.[356]

In 1946, the Alaskan military commands moved back to Kodiak, Elmendorf AFB and Fort Richardson. The Air Force took over Adak and renamed it Davis Air Force Base.[357] Along with Shemya, Davis weathered the 1940s while all other Aleutian bases were closed.[358] On 1 July 1950, Davis was handed over to the Navy.[359] Until 1971, Kodiak was the center of Alaskan naval activity. Adak had minimal staffing and limited importance until the 1970s.[360] In 1953, Adak housed only 200 personnel, a number that grew to just under 1,000 by 1966.[361] But the force restructuring of the 1970s would significantly alter the naval presence in Alaska. In 1970 President Nixon's Blue Ribbon Defense Panel recommended the Alaskan Command be disbanded, arguing that Alaska's primary function was as a subsidiary of the Strategic Air Command.[362] Troop numbers in Alaska dropped throughout the late 1960s and early 1970s, culminating in the termination of Alaska's unified command structure. AAC was spared, but USARAL was terminated in 1974 and ALCOM in 1975. ALSEAFRON was the first casualty. During the 1970s, the United States pursued a policy of détente with the Soviet Union. The era was marked by the first strategic arms talks on nuclear weapons reduction and an emphasis on increased efficiency and cost savings in the Armed Services.

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[351] Perras, 185.
[352] National Park Service, Kodiak Naval Operating Base and Forts Greely and Abercrombie, http://www.nps.gov/resources/site.htm?id=19803. Accessed July 2012.
[353] Morison, Samuel Eliot. History of United States Naval Operations in World War II. Vol. 7: Aleutians, Gilberts and Marshalls, June 1942-April 1944. Urbana, IL: University of Illinois Press, 1962, 12.
[354] Goldstein, Donald. *Williwaw War: The Arkansas National Guard in the Aleutians in World War II*. Fayetteville, AR: University of Arkansas Press, 1992, 237.
[355] Garfield, 242.
[356] The "stepping stone" idea, vociferously advocated by Howard Handleman and other World War II journalists, briefly reappeared in 1972 when Adak commander Captain G.F. Thummel suggested Adak would be "an excellent stepping stone" in the event of war with the USSR. Perras, 186.
[357] Adak Update: Environmental cleanup and closure of the former Naval Air Facility, Adak, Alaska. Background. http://www.adakupdate.com/bkg.html, accessed July 2012.
[358] Cloe, "The War's Aftermath," 396–397.
[359] "Chronology: The Air Force in Alaska."
[360] Nielson, 201.
[361] Adak Update.
[362] ALCOM History, 1970, 12–13.

On 30 June 1971, ALSEAFRON was dissolved. It was not replaced. After the dissolution of ALSEAFRON, naval forces in Alaska were based at Adak and reported to COMHAWSEAFRON, or Commander, Hawaiian Sea Frontier, and the Pacific Fleet. The 13th Naval District in Seattle oversaw certain tasks. To maintain continuity with ALCOM, COMHAWSEAFRON designated a liaison officer in Alaska, a Navy captain rather than ALSEAFRON's rear admiral.[363] Kodiak Naval Station was turned over to the Coast Guard in 1971. For Adak, $4.8 million were appropriated in 1970 to build a new enlisted barracks and a tactical support center.[364] By the 1980s, Adak had more than 6,000 personnel, [365] an increase of one third over the entire ALSEAFRON strength in 1968.[366]

Substantial classified activity took place at Adak. Major operations included radio direction finding, specialized signal monitoring, subsurface sound detection, low frequency communications to American submarines in the Pacific and Arctic oceans, and special weapons support for P-3 Orion antisubmarine aircraft patrols.[367] The antisubmarine patrols were nuclear capable. Reportedly, B-57 nuclear antisubmarine depth charges—510-lb., ten-foot monsters—were stockpiled should the Orions need them. The Navy has not acknowledged the presence of nuclear weapons. However, the presence of a battalion of Marines, at a post 100 sea miles from civilians and 1,400 miles from Anchorage has led to considerable speculation as to whether nuclear weapons were in fact held at Adak.[368]

The major naval danger to Alaska was that of Soviet submarines based at Vladivostok. In 1961, COMALSEAFRON informed CINCAL that he was completely unable to combat submarines from the surface. He requested an antisubmarine early warning system, and CINCAL agreed, though as of 1962 no system was in place.[369] Throughout the 1970s, however, the Arctic became increasingly important to naval operations.[370] By 1989, Naval Station Adak supported the naval facility, the Marine Support Battalion and Marine Corps security personnel. The Naval Security Group Activity managed intelligence, direction finding and classified communications.[371]

Fortuitously situated midway between Washington and Japan, near major shipping lanes, Adak was an ideal site for intelligence gathering and got several detection systems. The Circularly Disposed Antenna Array, completed in 1956, performed radio direction finding for naval and intelligence operations. It was one of only eight worldwide and was demolished in 1996, although some buildings survive. Classic Wizard, an ocean surveillance program, used specialized signal monitoring. Its buildings are still extant, northeast of the main installation. SOSUS, or the Sound Surveillance System, was built in 1962 and updated in 1986. It operated from the now-abandoned Naval Facility Compound, giving the Pacific Fleet underwater ocean surveillance. A special antenna field allowed contact with fast-attack submarines. Its antennae are gone, but the buildings remain, suffering the effects of wind, rain and salt spray.[372]

***Adak 1**

[363] ALCOM History, 1971, 4.
[364] ALCOM History, 1970, 83.
[365] Fact Sheet, Military History in Alaska, 1867–2000.
[366] ALCOM History, 1968, 14.
[367] Hummel, *Alaska's Militarized Landscape*, 99.
[368] Hummel, 211.
[369] ALCOM History, 1961, 22–23.
[370] Nielson, 201.
[371] Hummel, *Alaska's Militarized Landscape*, 210.
[372] Hummel, 214–217.

Adak in 1943 was a collection of tents and a soggy runway. Its abysmal living conditions personified the nature of World War II operations in what naval historian Samuel Eliot Morison called "the theater of military frustration."[373] By 1945, Adak had staging facilities and depots, could accommodate 50,000 troops and three months' supplies, and had 4,500 men stationed at the post. Six ships could be berthed at a time, and a 1,500-foot breakwater and 2,900-foot retaining wall were emplaced.[374] Adak would continue to grow from the 1940s into the 1990s. In August 1959, Public Land Order 1949 set aside the entire northern portion of the island for naval use. The military reservation swelled to 76,000 acres.[375] The installation included seven underground nuclear shelters. These shelters were built in 1989 and only designed to house 600 personnel, one tenth of Adak's all-military-affiliated population.[376] At its closure, Naval Air Facility (NAF) Adak was the only significant piece of WWII Aleutian construction left in use.[377] A White Alice station built during the Project Bluegrass expansion was destroyed by the Navy prior to the base's closure.[378]

Adak's former base is divided into two developed areas. The airport, seaport, landfills, sewage treatment, light industrial, recreational, administration and residential areas are "downtown." This area is now owned by the Aleut Corporation. The northern portion of the island was used by the Naval Security Group and was closed in 1997.[379] Beyond its mission-oriented structures, Adak was a veritable city. It had a shopping mall, a McDonald's restaurant, a bowling alley and other amenities. A hospital was built in 1990 for $18 million. At the time of its closure, Naval Complex Adak had a full airport with glidescope and instrument landing system. Its POL storage could accommodate 20 million gallons of fuel.[380] The two runways were each 200 feet wide. One was 7,790 feet long and the other 7,605.[381] All the construction and 55 years of occupation had an environmental cost. By 1979 the Army Corps of Engineers had surveyed the Alaska Peninsula and Aleutians and identified 600 cleanup sites, Adak among them.[382] The Navy began environmental restoration in 1986 and continued through at least 2008.[383]

***Adak 2**

Adak was on the front lines of World War II and the Cold War, but it was too remote to be practical in a post-Cold War world. Lacking Shemya's major intelligence facility, Adak was slated for termination in the 1995 Base Realignment and Closure Act. On 31 March 1997, the Navy placed it in caretaker status. Naval Air Facility Adak, as it was rechristened in November 1994, closed on 30 September 2000. The U.S. Fish and Wildlife Service acquired 71,171 acres of the naval base in March 2004, and in turn traded 47,000 acres to the Aleut Corporation for other lands in the chain. The airport and support buildings were remanded to the State of Alaska Department of Transportation.[384] After 58 years of service, Adak had reverted to civilian hands. In

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[373] The Aleutians were an astoundingly awful place for military operations. "Sailors, soldiers and aviators alike regarded an assignment to this region of almost perpetual mist and snow as little better than penal servitude," naval historian Samuel Eliot Morison reported. The struggle against the elements gave even major operations an air of futility. Following the "great, big, expensive, juicy mistake" at Kiska an unkind rhymester jibed, "O here's to mighty ComNorPac (Commander, North Pacific Force, VADM Thomas Kinkaid) / Whose kingdom lay at cold Adak, / Whose reign was known to fame for fog / And capture of two couple dog." Morison, 3, 12; Goldstein, 315.
[374] Mighetto and Homstad, 116.
[375] "Adak Naval Air Station, Alaska." Environmental Protection Agency. http://yosemite.epa.gov/r10/nplpad.nsf/0/455c389cc2d7653e85256617006a3028!OpenDocument. Accessed June 2012.
[376] Hummel, *Alaska's Militarized Landscape*, 218.
[377] Hummel, 99.
[378] Hummel, 210.
[379] Adak Update.
[380] Aleut Enterprise, LLC. "Adak." http://www.adakisland.com/adak.htm. Accessed July 2012.
[381] Cashman, Kay. "Oil and Gas Industry Turns to Adak to Support Development." *Anchorage Daily News*, 3 July 2012, http://www.adn.com/2012/07/03/2530524/oil-and-gas-industry-turns-to.html#storylink=misearch. Accessed July 2012.
[382] Mighetto and Homstad, 373.
[383] Adak Update.
[384] EPA, "Adak Naval Air Station, Alaska."

2012, Adak was the westernmost municipality in Alaska. The island supported a population of 331, occupying 44 of 500 housing units in the city of Adak, incorporated in 2001.[385] The island's financial base consisted of fish processing, crew transfer for Pacific fishing fleets, and a fledgling refueling industry.[386]

The Army in Alaska

The foundation of the U.S. Air Force in 1947 effectively removed the Army from offensive strategic thinking. While the Navy and Air Force struggled over the privilege of delivering nuclear weapons,[387] the Army was relegated to land warfare, occupation duty and ground-based air defense.[388] Since the Army's primary foe was the Soviet Union, Alaska assumed new importance as a center for northern warfare training. The Army has conducted Alaskan exercises approximately every other year since 1947.

***Army 1**

The Korean War helped cement the Army's role in the post-World War II world, and the Soviet detonation of a hydrogen bomb in 1953 ensured that Alaska's military presence would remain strong. But along with the world strategic situation, USARAL's mission changed in the 1960s. Under President Eisenhower, defense spending concentrated on development of a nuclear arsenal, a delivery system, and air defense. Despite the buildup attending the Korean War, conventional forces were de-emphasized in favor of nuclear brinkmanship. The goal was containment of communism. The means was threat of "massive retaliation," or nuclear holocaust. Nuclear weapons were both a convenient force multiplier in the face of superior Soviet numbers, and cheaper than conventional forces. Massive retaliation's attractiveness paled by the late 1950s, as the Soviets developed the capability to unleash nuclear destruction on America. In contrast, President Kennedy and Secretary of Defense McNamara's concept of "flexible response" sought to avoid nuclear war by preparing conventional forces capable of matching the Soviets in Europe. The Army's fortunes prospered accordingly. Flexible response gained credit following the Cuban Missile Crisis, which illustrated the dangers of massive retaliation.[389]

While the Army continued to expand, flexible response lost its teeth in the Vietnam War as the United States increasingly focused on preventing the communist takeover of countries outside the Soviet sphere. Troops in Alaska were increasingly trained in jungle warfare, and large numbers were diverted to southeast Asia.[390] Exercises were cancelled as funding and troop strengths dropped.[391] In 1973, Forces Command (FORSCOM) took over Alaskan Army units, under the umbrella of the U.S. Army Pacific (USARPAC). USARAL was discontinued in 1974, leaving the 172nd Infantry Brigade to assume control over the U.S. Army Test Center, U.S. Army Communications Command Agency Alaska, U.S. Army Medical Department Activity Alaska, the Arctic Medical Research Laboratory Alaska, and other base operations, cold climate training and research functions. The 172nd was left in overall control of the Army in Alaska and reported directly to FORSCOM at Fort McPherson, Georgia. [392]

***Army 2**

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[385] Alaska Community Database Community Information Summaries (CIS), http://www.commerce.state.ak.us/dca/commdb/CIS.cfm?Comm_Boro_Name=Adak. Accessed July 2012.
[386] Cashman.
[387] Rosenberg, David Alan. "Origins of Overkill: Nuclear Weapons and American Strategy, 1945-1960." *International Security* 7, no. 4 (Spring 1983), 3–71, 5.
[388] Waddell, Karen. *Cold War Historical Context 1951–1991: Fort Richardson, Alaska; United States Army Alaska*. Fort Collins, CO: Center of Environmental Management of Military Lands, Colorado State University, March 2003, 13.
[389] Schwartz, 20–26.
[390] "Muskeg Training Put to Test in Viet Nam." *Fairbanks Daily News-Miner* Progress Edition, 17 March 1966, C-28.
[391] ALCOM History, 1968, 13.
[392] Waddell, 29–31.

Defense funding in Alaska grew throughout the 1980s. As détente crumbled and the Soviets invaded Afghanistan, the U.S. military's funding rebounded from its post-Vietnam slump. While the Soviets remained the primary enemy, the Army increasingly focused on preparing for low-intensity conflicts around the world. In 1986, the assignment of the 6th Infantry Division (Light), the first division-level unit in Alaska since World War II, signaled the Army's final transition from Alaskan defense force to rapid-deployment worldwide strike force.[393] Headquartered at Fort Richardson 1986–1990, the 6th replaced the 172nd as the Army's primary Alaskan force. It was positioned to take advantage of Alaska's "unique training environment" and short polar routes to world trouble spots.[394] Training not just in Alaska but also worldwide, in Japan and Thailand, the 6th served the Army in Alaska until its deactivation in 1994.[395]

***Army 3**

The U.S. Army, Alaska (USARAK) was activated in 1994 as part of the reestablished Alaskan Command. It replaced the 6th Infantry Division (Light) as the overall Army command in Alaska. Force structure evolved into the 2000s, guided by the Army's 1999 Transformation Campaign Plan. The new plan continued the theme of rapid worldwide deployment that had brought the 6th Infantry Division to Alaska. It was further refined in the 2004 Army Modernization Plan. Created to facilitate the Army's deployments to Afghanistan and Iraq, the plan called for establishment of modular brigade combat teams.[396] Accordingly, the 172nd Infantry Brigade (Light) was transformed into the 1st Stryker Brigade Combat Team, 25th Infantry Division (1/25 SBCT) and stationed at Fort Wainwright. The 1-501st Parachute Infantry Regiment was expanded into the 4th BCT (Airborne) at Fort Richardson.[397]

***Army 4**
***Army 5**

***Army 6**

Forces and equipment may change, but training exercises have been the mainstay of Army activities in Alaska since the end of World War II. Exercises gave commanders the opportunity to test equipment and doctrine, coordinate forces on a large scale, and provide field experience to thousands of troops. While some have been held in the summer, the vast majority were winter operations. The first Alaskan postwar exercise was Task Force Frigid/Williwaw, a two-pronged exercise at Ladd Field, and Adak meant to test clothing and equipment in cold weather.[398] Exercise Yukon, the first of ALCOM's winter field problems, was held in winter 1947–1948.[399] Exercises during the Cold War were conducted using multiple combinations of forces, including Alaskan troops, other American units, Canadians[400] and Norwegians.[401] Vietnam slowed the exercise schedule

[393] Naske and Slotnick, 2011, 212.
[394] Mighetto and Homstad, 339.
[395] "History of the U.S. Army in Alaska." U.S. Army Alaska, http://www.usarak.army.mil/main/USARAK_History.asp. Accessed July 2012.
[396] 4th Brigade Combat Team (Airborne), 25th Infantry Division. U.S. Army Alaska, 13 December 2010, http://www.usarak.army.mil/4bde25th/. Accessed July 2012.
[397] *Stationing and Training of Increased Aviation Assets within U.S. Army Alaska Environmental Impact Statement*. Cultural Resources Technical Report, U.S. Army Alaska, June 2009, 2-2.
[398] AAC History, 1945–47, 76.
[399] "A short history of Ft. Greely and the Arctic Test Center." *The Arctician*, 3 October 1975.
[400] "State Military Forces Keep Pace." *Fairbanks Daily News-Miner*, 1967 Progress Edition, D-20.
[401] "Ace Card Exercises Draw the Troop Units." *Fairbanks Daily News-Miner* 1975 Progress Edition, C-15.

and pulled forces away.[402] Exercise Polar Strike in 1965 involved 8,000 troops, but next year's exercise named Dall Sheep used only 1,000.[403] By 1975, the post-Vietnam Army was resurgent, and Jack Frost 1976 took up 24,000 personnel.[404] The most prominent exercise series were the Frontier Assault series in the 1950s and early 1960s, and the Jack Frost/Brim Frost series, which extended from the mid-1960s to 1991.

***Army 7**
***Army 8**

Exercises continued following the Cold War's end and ALCOM's reestablishment. Arctic Warrior was the first exercise under the new ALCOM rather than FORSCOM. The Northern Edge series, a biannual program running from 1993 through 2012, emphasized seamless coordination between all four services in an Alaskan environment. NE11 in June 2011 was supported by an aircraft carrier and featured a harbor defense scenario, electronic warfare, an airdrop and ground exercises.[405]

Fort Richardson, 1940-Present

Fort Richardson at Anchorage, now part of Joint Base Elmendorf-Richardson, is the Army's principal base in Alaska. It was the unified command headquarters of the U.S. Army in Alaska from 1947 until 1974 and has been headquarters for the U.S. Army Alaska since 1994.

One of Alaska's first World War II installations, Fort Richardson was founded by Executive Order 8102, 29 April 1939.[406] It received its first troops on 27 June 1940.[407] Richardson shared its territory with Elmendorf Field and was sited to take advantage of the "mild" weather in the Cook Inlet area and the nearby Alaska Railroad. Its development paralleled that of Elmendorf Field until their separation at the end of 1950. The fort was named for Brigadier General Wilds P. Richardson, one of the most prominent Army officers in Alaska during the Gold Rush years. During World War II, Richardson developed into a supply and repair center and headquarters. Fort Richardson funneled supplies to the front during the Aleutian Campaign. After World War II as the Cold War developed, Fort Richardson's Army component atrophied. Early Cold War defense funding focused primarily on air power and defense at the expense of ground troops. But the Korean War and its attendant buildup, with troops flooding through Alaska on their way to the front, would give Fort Richardson new life.

***Rich 1**

Department of the Army General Order 33 of 10 October 1950 separated Fort Richardson and Elmendorf Air Force Base. Since old Fort Richardson was primarily an Air Force facility, the Army established its new base five miles away on a 33,000-acre military reservation.[408] By 1954, Fort Richardson's boundaries had expanded to encompass terrain north of Eagle River, making the military reservation 67,296 acres.[409]

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[402] In his forward to the 1971 ALCOM History, CINCAL Lieutenant-General Robert G. Ruegg noted that due to American involvement in Vietnam, Alaskan appropriations had been "austere" and that exercises, when they happened at all, were much reduced and subject to cancellation.
[403] FDNM, "State Military Forces Keep Pace."
[404] News Release, "US Army, Canadians Participate in Jack Frost 76." United States Air Force, Headquarters, Alaskan Air Command, n.d.
[405] U.S. Air Force. "Northern Edge Participants Complete Successful Exercise. 29 June 2011. http://www.af.mil/news/story.asp?id=123262013. Accessed 11 July 2012.
[406] Waddell, 15.
[407] Nielson, 99.
[408] Waddell, 12–15.
[409] Pamphlet 360-5, 89–90.

***Rich 2**

Laid out on a grid following Richardson Drive, the new fort was largely made of permanent concrete buildings. Between 1950 and 1953, barracks, warehouses, family housing, underground utilities, service clubs, streets, schools, a theater, field house and more were constructed. Most family housing was in the south, with industrial buildings in the north and administration in the center. Housing exploded in the 1950s. In one year Fort Richardson jumped from 24 family housing units to nearly 1,200 by the end of 1951. Alaska experienced a Cold War construction boom, and the military struggled to keep up.[410] A $6 million project in 1961 expanded Richardson's quarters yet again. Construction was interrupted by the Good Friday Earthquake of 1964. Warehouses and offices were severely damaged, along with the Skyline Service Club. One man was killed. Damage was later assessed at $17 million.[411]

Beginning in the 1960s, housing construction at Fort Richardson followed a new trend. As the Army realized that happy families made happy troops, it invested increasingly in family housing, a development unseen at Fort Richardson in the 1940s. A further shift toward accommodating troops took place starting in the 1970s. Rather than open barracks for draftees, the new construction and renovations focused on smaller rooms for fewer, volunteer soldiers in an effort to improve morale.[412] Thus the buildings constructed in the 1960s and 1970s were largely dedicated to housing and support.[413] By 2012, Fort Richardson's cantonment area covered 5,760 developed acres and had a golf course and a ski hill. The remainders of Richardson's current 61,000 acres were maneuver areas.[414]

***Rich 3**

The key mission at Fort Richardson throughout the Cold War was the defense of Elmendorf Air Force Base. However, in practice, the mission was a multifaceted creature rarely concerned with imminent Soviet invasion.[415] During the 1950s, Fort Richardson helped carry out the USARAL missions of ground and air defense, cold weather and mountain warfare training, logistical support to other services, National Guard and ROTC training and supervision, and internal security, which encompassed preparation for nuclear attack and recovery. The U.S. Army Supply and Maintenance Center (USASMCA) was the primary provider of supply and maintenance support. Fort Richardson troops participated in most major exercises in Alaska. Richardson was also a main staging area for exercise participants arriving from outside Alaska or the United States. From 1950 until 1958, Richardson personnel also provided basic training to new recruits.

***Rich 4**

Richardson's mission and force structure evolved in the 1960s. USARAL Support Command replaced USASMCA in April 1960, streamlining supply and maintenance operations. Also in 1960, the 64th Field Hospital was activated at Fort Richardson. The Army's Reorganization Objective Army Division (ROAD) concept was adopted in 1963, necessitating a reorganization of USARAL. The previous battle group/division system was replaced by a system centered on brigades of varying size. The new 172nd Infantry Brigade (Mechanized) comprised 1st Battalion (Mechanized), 60th Infantry Regiment, 4th Battalion, 23rd Infantry, Company D, 40th Armor, 562nd Engineer Company (Combat), and Headquarters and Headquarters Co., 172nd

[410] Mighetto and Homstad, 258–259.
[411] Pamphlet 360-5, 111.
[412] Mighetto and Homstad, 278.
[413] Waddell, 24–25.
[414] 2008–2012 U.S. Army Garrison Alaska Integrated Cultural Resources Management Plan. Fort Richardson, AK: 26 November 2007, 18.
[415] Waddell, 24.

brigade. The 33rd Signal Battalion was also activated. 1964 brought the 19th Aviation Battalion, which replaced the USARAL Aviation Battalion. Equipped with CH-21 helicopters and U-1A Otter airplanes, the 19th Aviation was divided between forts Richardson and Wainwright. Aiming to increase efficiency, the Army also assigned each brigade a support battalion.

In the late 1960s, the 4th Battalion, 23rd Infantry was deployed to Vietnam from Fort Richardson. In 1969, the force structure changed again. The mechanized brigades were changed to light infantry. Each comprised two infantry battalions, including one airborne company, an artillery battalion using towed 105-mm howitzers rather than self-propelled guns, a support battalion, an engineer company, a transportation company, and an armored cavalry troop using M-551 Sheridan airborne assault vehicles.[416] Fort Richardson was also home to the Alaska National Guard's 1st and 2nd Scout Battalions, formed in 1949. The largely Alaska Native force augmented Air Force and Navy patrols by reporting suspicious activities on and near the coast.[417] Well into the 1970s, the Alaska Scouts worked closely with headquarters at Fort Richardson, often cross-training with their active duty fellows.

***Rich 5**

The turbulent 1970s saw the Army transition to an all-volunteer force in 1973, and witnessed the dissolution of USARAL and ALCOM. For a decade the Army in Alaska became a one-brigade force with command still at Fort Richardson. The shortlived Company O, 75th Infantry Regiment, Arctic Rangers, was activated in 1970 and disbanded three years later, its troops incorporated into the 172nd's airborne units.[418] The 1980s brought Alaska additional troops and an entire division, the 6th Infantry Division (Light) in 1986. By 1990 ALCOM had returned, and 1994 saw Fort Richardson reassume its duty as headquarters, U.S. Army Alaska. In 2009 Fort Richardson was reunited with Elmendorf Air Force Base, this time as a tenant in an Air Force-run facility. See the Elmendorf AFB segment for a discussion of the BRAC process that created JBER. Fort Richardson in 2012 contained a full range of military amenities and support facilities, including unit headquarters and barracks, storage, childcare and a small dental clinic.

***Rich 6**

In 2012, the primary combat unit at Fort Richardson was the 4th Brigade Combat Team (Airborne), 25th Infantry Division, activated 16 July 2005.[419] The 4th BCTA, the newest of only six in the Army, was created in the defense spending boom following the September 11, 2001, terrorist attacks. It held the distinction of being the only airborne brigade combat team in the Pacific theater. In addition, 4/25 BCTA was the Pacific theater's primary response force. In 2012, the 4th BCT had been deployed to Iraq once and Afghanistan twice.[420] The other major tenant organization at Fort Richardson was the 2nd Engineer Brigade, activated 26 September 2011. According to USARAK, the 2nd Engineer Bde "is a modular deployable headquarters able to function as a higher headquarters for several subordinate engineer units and could potentially function as a joint headquarters including Army, Navy, Air Force or Marine components."[421]

Fort Wainwright, 1961-Present

[416] Waddell, 24.
[417] Waddell, 13.
[418] Waddell, 29–30.
[419] "Reorganization of the 25th Infantry Division." 25th Infantry Division Association, 30 October 2010, http://www.25thida.org/divreorg.html. Accessed July 2012.
[420] 4th Brigade Combat Team (Airborne).
[421] "Engineer Brigade stands up at JBER." 2nd Engineer Brigade Public Affairs Office, U.S. Army Alaska, 30 September 2011, http://www.usarak.army.mil/main/Stories_Archives/Sep26-30-2011/110926_FS2.asp. Accessed July 2012.

On 1 January 1961, the U.S. Army took over Ladd Air Force Base and renamed it Fort Jonathan Wainwright, after the hero of Corregidor. The Army had already been at Ladd, guarding the airfield, training recruits and conducting a cold weather school. The new fort maintained the Army's presence, in force, north of the Alaska Range. Its mission evolved from ground and air defense to training and, since the mid-1980s, worldwide deployment.[422]

***Wainwright 1**

Maneuver areas define Fort Wainwright. The Tanana Flats Training Area (TFTA), the Yukon Training Area (YTA), and the Donnelly Training Area (DTA)[423] total approximately 1,559,000 acres. The cantonment, TFTA, and YTA are located in the Fairbanks North Star Borough, and DTA is located near the town of Delta Junction, 100 miles southeast of Fairbanks. The Tanana Flats Training Area was set aside by Executive Order 8847 in 1941[424] and the Yukon Training Area in 1964.[425] In 1995, the BRAC process closed Fort Greely and passed its training and testing facilities to Fort Richardson. Within a year, the property had passed to Fort Wainwright. Comprising 624,000 acres, the former Fort Greely lands included the Donnelly Training Area and its satellites: Black Rapids, Gerstle River and Whistler Creek Rock Climbing training areas.[426] The land realignment increased Fort Wainwright's area by over one third. From the 1940s on, Ladd/Fort Wainwright's training areas hosted the bulk of ground exercises in Alaska.

***Wainwright 2**

Fort Wainwright entered existence with a full array of facilities. Within the previous 12 years, the Air Force had constructed family housing, barracks, utilities, a hospital, hangars, ammunition storage, and improved the airfield. For the next 20 years, the Army was left with little to do but maintain the base's current format, although the 1967 Chena River flood inundated North Post and extensively damaged its infrastructure. But by the 1970s, housing, always an issue at Alaskan bases, was in particularly short supply at Fort Wainwright. The cause of the shortage was the construction of the Trans-Alaska Pipeline. Not only did the Alyeska Pipeline lease facilities on Fort Wainwright and establish its headquarters on North Post, but also the pipeline project itself increased costs to the point that Fort Wainwright lost building contracts. In 1975, the House Appropriations Committee cancelled a $12 million barracks upgrade citing budget constraints.[427] The situation grew serious enough that the full deployment of the 6th Infantry Division (Light) in 1986 was delayed by lack of billets. Over half the $1 billion spent activating the 6th LID went to housing. These "801 houses," Fort Wainwright's last phase of Cold War construction, were built both on and off post, to a comfort level rarely seen in previous military lodging.[428] Construction at Fort Wainwright continued into the post-Cold War era. Bassett Army Community Hospital, which the Air Force had built in 1951, was at last replaced by a 259,000-square-foot, $225 million hospital bearing the same name.[429] As late as 2011, Congress appropriated $114 million for an aviation complex.[430]

***Wainwright 2**

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[422] *Stationing and Training of Increased Aviation Assets*, 1-3.
[423] The Donnelly Training Area formerly was part of Fort Greely, but has been realigned to Fort Wainwright.
[424] United States Department of the Interior District Land Office, 8 August 1941.
[425] ALCOM History, 1965.
[426] *Stationing and Training of Increased Aviation Assets*, 32.
[427] *The Cold War Historic Context of Fort Wainwright and Ladd Air Force Base*, 2-7.
[428] Mighetto and Homstad, 358–362.
[429] "Bassett Army Community Hospital History." U.S. Army Medical Department: MEDDAC-Alaska. 20 December 2010. http://www.alaska.amedd.army.mil/about/About_Bassett_army_community_hospital.htm. Accessed July 2012. The hospital was named for Captain John Winfield Bassett, killed defending his patients on 29 May 1943, at Attu Island.
[430] "Defense Bill with Big Alaska Projects Passes." *Fairbanks Daily News-Miner*, 15 December 2011, http://www.newsminer.com/view/full_story/16806296/article-Defense-bill-with-big-Alaska-projects-passes?. Accessed July 2012.

Fort Wainwright's early missions were ground and air defense of Alaska and its Air Force bases, northern warfare doctrine development, training and support, logistics, National Guard and Reserve support, and civil defense assistance. Troops at Fort Wainwright fell under USARAL's Yukon Command, which directed all Army operations north of the Alaska Range until its discontinuation in 1968. Reflecting Alaska's position in the national order of battle as an air defense command, Alaskan troop numbers were always low compared to those in Europe, the other "front line" against the Soviets. USARAL strength in 1960 was 12,205 compared with 250,000 Army forces in Europe.

The 9th Infantry Regiment, stationed at Ladd AFB in 1956, was the primary unit until 1963. The ROAD plan brought in the 171st Infantry Brigade, as Fort Richardson received the 172nd. The 171st Brigade had two infantry battalions, a field artillery battalion, an armor company and an engineer company. With the rest of ALCOM, Vietnam impacted Fort Wainwright significantly. The 1st Battle Group, 9th Infantry was assigned to Vietnam in 1966 and was gradually replaced by other forces.[431] Units were understaffed through the late 1960s, and exercises were minimally attended or cancelled. Along with the 172nd, the 171st was reorganized into a light infantry configuration in 1969. Two infantry battalions were supplemented by an artillery battalion and a support battalion, an engineer company, a transport company, and an armored cavalry troop.

***Wainwright 3**

The 1970s drawdown of forces hit Fort Wainwright hard. The Army decreed a cut of 4,000 personnel from USARAL in March 1972, to be complete by the end of 1973. While fewer personnel were cut due to understrength units, Wainwright lost first the 808th Engineer Battalion and then the 171st Infantry Brigade. The fort was left with elements of the 172nd Infantry Brigade commanded from Fort Richardson.[432] The post-Vietnam budget cuts nearly resulted in the closure of North Post, the original Ladd Field. The Army declared North Post "excess" in 1973 and initiated proceedings to dispose of its property. Fortunately for Fort Wainwright, Congress vetoed the Army's action and, instead, excess buildings were leased out to the Bureau of Land Management. The arrangement continued through 2012.

The last Cold War reorganization came in 1986, when the 6th Infantry Division (Light) was activated. Though troop deployments outside Alaska had occurred throughout Vietnam, such actions had always been outside the Army in Alaska's stated mission. The 6th LID's primary mission was rapid worldwide deployment, supplemented by the usual mission of defending Alaska.[433] In 1990, division headquarters moved to Fort Wainwright, where it remained until 6th LID's deactivation in 1994.[434] Upon USARAK's activation, overall Army control returned to Fort Richardson. On 17 April 1998, Fort Wainwright's 1st Brigade, 6th LID was renamed the 172nd Infantry Brigade. The brigade transitioned to an independent brigade combat team, without need of divisional headquarters, in 2003 and deployed to Iraq in 2005.[435] Upon its return, it was dissolved and replaced by the 1st Brigade Combat Team (Stryker).

***Wainwright 4**

Aviation units worked with Fort Wainwright's other forces from its creation. While they supported ground defense, aviation units primarily existed as transport for the infantry. Other missions ranged from flying the Haines-Fairbanks pipeline corridor to scouting for fires. Twice, the 12th Aviation Company sent its OV-1

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[431] *The Cold War Historic Context of Fort Wainwright and Ladd Air Force Base*, 3-4–3-5.
[432] Pamphlet 360-5, 128–129.
[433] *The Cold War Historic Context of Fort Wainwright and Ladd Air Force Base,* 2-5–2-7.
[434] Fact Sheet, Military History in Alaska, 1867–2000.
[435] U.S. Army, Europe & Seventh Army Fact File. History – 172nd Infantry Brigade. 7th Army Public Affairs, May 2008, 30. http://www.172infantry.army.mil/Info/History/FactFile_History-172Infantry_2008-05.pdf. Accessed July 2012.

Mohawk observer planes to observe Soviet activities on Big Diomede Island.[436] The 222nd Aviation Battalion replaced the 19th Aviation Battalion in 1972 and saw Fort Wainwright into the 1980s. In 2012, the 16th Combat Aviation Brigade (CAB) served Fort Wainwright with UH-60 Blackhawks, CH-47 Chinooks, and OH-58D Kiowa Warriors.[437]

***Wainwright 5**

Fort Wainwright's dominant warfighting unit in 2012 was the 1st Brigade Combat Team (Stryker), 25th Infantry Division, activated 16 December 2006.[438] The mission of the 1st SBCT was to deploy rapidly "to a designated contingency area of operation by air and [conduct] operations either as a separate Brigade Combat Team or under the control of a contingency force headquarters."[439] Equipped with wheeled Stryker armored vehicles, the brigade filled the gap between light forces like the 4th BCTA and heavy, armored units.[440] Sharing the post were the 16th Combat Aviation Brigade (Alaska) and the Medical Department Activity-Alaska, leaving Fort Wainwright with a total of approximately 7,700 infantry, field artillery, air cavalry, engineer, logistical support and medical troops.[441]

Tomorrow's War

"Some would argue," historian Kathy Price observed, "that technological competition was the central strategic aspect of the cold war."[442] Nowhere was this more evident than in the constantly shifting defense systems installed in Alaska. But radar sites, jets, and ground troops were only one part of defeating communism. America needed to show that it was superior, not just militarily, but in all facets of life. Even household appliances were weapons in the struggle between the U.S. and the Soviet Union, as the "kitchen debates" between Nikita Krushchev and Richard Nixon showed.[443]

Alaska's extreme weather and remoteness lend themselves to cold weather testing and arctic research. Ladd Field was founded as a cold weather testing station. Fort Greely's inhospitable surroundings made it perfect for an experimental nuclear reactor designed to operate far from traditional infrastructure, and also for an arctic and mountain warfare school. Likewise, Amchitka Island's location minimized fallout concerns. Point Thompson, one of the more isolated corners of Alaska, would ostensibly be made *less* secluded by its deep-water port. In nuclear experimentation, arctic research and cold weather training, Alaska was at the forefront of the Cold War technology race.

The Atomic Alaska, 1958–1972

The "problem" with nuclear weapons was that they hardly could be used. In 1946, only a year after the nuclear bomb was dropped on Hiroshima, the Atomic Energy Act created the Atomic Energy Commission (AEC).

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[436] *The Cold War Historic Context of Fort Wainwright and Ladd Air Force Base,* 3-7.
[437] 16th CAB/History. U.S. Army, 21 September 2011, http://www.wainwright.army.mil/16CAB/BDE_WEB/history.html. Accessed July 2012.
[438] "Reorganization of the 25th Infantry Division."
[439] 1/25th Stryker Brigade Combat Team: Mission. 25th Infantry Division, http://www.25idl.army.mil/1bct_mission.html, accessed July 2012.
[440] 1st Stryker Brigade Combat Team "Arctic Wolves." http://www.wainwright.army.mil/1_25_SBCT/index.html, accessed July 2012.
[441] Fact Sheet, Fort Wainwright History. http://www.wainwright.army.mil/sites/commander/welcome.asp. Accessed July 2012.
[442] Price, *Tracking the Unthinkable*, 5.
[443] Safire, William. "The Cold War's Hot Kitchen." *The New York Times*, 23 August 2009. http://www.nytimes.com/2009/07/24/opinion/24safire.html?pagewanted=1&_r=2. Accessed July 2012.

AEC's mandate was to pursue peaceful uses for atomic fission.[444] Exploring nonviolent uses for nuclear power allowed continued research, after the nuclear test ban treaty was signed in 1963. Alaska was the site for a proposed attempt to use nuclear devices peacefully, three underground nuclear detonations, and an experimental nuclear reactor. By the early 1970s, the nuclear mania had faded. The 1969 National Environmental Policy Act, signed into law by President Nixon 1 January 1970, was prompted by a rising tide of public awareness of environmental issues. Activist Rachel Carson's 1962 exposé *Silent Spring*, the discovery of oil at Prudhoe Bay, and incidents like the 1969 Cuyahoga River fire fed a growing conviction that the federal government was not only responsible for national security, but for environmental protection as well.

Project Chariot, 1958–1963

The Atomic Energy Commission's Project Plowshare, a program meant to promote peaceful uses for nuclear devices, was authorized in 1957. Its planners foresaw a world transformed by nuclear energy. The most farfetched Plowshare idea was a sea level Panama Canal, with no need for locks. However, such ambitious terraforming required testing. In July 1958, Dr. Edward Teller, director of the Lawrence Livermore National Laboratory, visited Juneau to promote the AEC and advance his idea to create a deep water harbor near Cape Thompson in northwest Alaska, 30 miles from Point Hope. Five nuclear devices buried near the mouth of Ogotoruk Creek would create the harbor he envisioned. The two-megaton blast would leave a keyhole-shaped harbor, simultaneously giving northwest Alaska a deep-water port and testing the AEC's concept.

***Chariot 1**

The scheme was carefully researched. In 1958, the U.S. Geological Survey established a base on Ogotoruk Creek near the proposed blast site. Scientists contracted to the AEC conducted numerous tests over the next three years, including drilling for core samples and conducting an environmental study to determine the best time of year to conduct the blast.[445] A small community sprang up as Jamesway huts, other temporary buildings and an airstrip were constructed. The field had a 2,200-foot runway, supplemented by a 750-foot runway with a 450-foot crosswind strip. Roads, drilling pads, gravel quarries and other features spread across the area in 1959 and 1960. Much of the site's built environment remained in 2004, when the Bureau of Indian Affairs conducted a cultural resources study.

***Chariot 2**

Project Chariot, as this Alaskan adventure in "geographic engineering" was known, did not happen. Despite AEC's vigorous promotional campaign, Alaska Native opposition crystallized when the AEC blithely told locals they would have to be relocated for at least one year. Local opposition, combined with growing horror on the part of the environmental community, conspired to let Chariot wither on the vine. The enterprise was never officially cancelled, but its engineering questions were largely answered by Project Sedan, a cratering experiment in Nevada in 1962. No nuclear detonations were ever conducted as part of Project Chariot. In 1963, the AEC transferred its land and facilities at Ogotoruk Creek to the Naval Arctic Research Laboratory (NARL). NARL departed in 1980.

Despite its anticlimactic denouement, Project Chariot had a significant impact on the landscape. In 1985 and 1987, the U.S. Army Corps of Engineers examined the site and removed a substantial portion of the debris left behind at Ogotoruk Creek. Radioactive soil left from experimental plots was discovered in 1990 and removed

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[444] Johnson, William R. *Testing Nuclear Power in Alaska: The Reactor at Fort Greely*. Master's Thesis. Fairbanks, AK: University of Alaska Fairbanks, 1993.

[445] O'Neill, Dan. *The Firecracker Boys.* New York: St. Martin's Griffin, 1995, 97, 107.

in 1993. The former site was incorporated into National Wildlife Refuge lands and an Alaska Native allotment.[446]

***Chariot 3**

Amchitka Nuclear Testing, 1965, 1969, 1971

Amchitka, the largest of the Rat Islands, lies near the western end of the Aleutian chain. It is long and narrow, 42 miles by 1.9 to 3.7 miles. Used during World War II as an air base, it drifted in and out of the Cold War military establishment. Amchitka Air Force Base, placed in caretaker status in 1949, was a SAC weather and search and rescue station. The island had a White Alice station from 1959 to 1961. The U.S. Navy's ROTHR portable radar system was built on Amchitka in 1988 and removed in 1993. But Amchitka's Cold War significance lies in the three underground nuclear tests conducted on the island between 1965 and 1973.

***Amchitka 1**

Amchitka was part of the Aleutian Islands Reservation (now the Alaska Maritime National Wildlife Refuge), a wildlife preserve created by President William Howard Taft in 1913. The legislation creating the three million acre refuge allowed military operations.[447] Underground nuclear testing was initially a military-only venture. In September 1949, Armed Forces Special Weapons Project chief General Kenneth D. Nichols issued a memorandum recommending underground nuclear tests. The Joint Chiefs of Staff agreed with General Nichols that nuclear warhead penetration and underground effects ought to be tested. They set aside $5 million for research and, by October 1950, had agreed to use Amchitka for the tests. The goal of the underground explosions was to "determine its military effects." The initial program, dubbed Operation Windstorm, called for a surface nuclear blast as well and was programmed for 1951. The Atomic Energy Commission became involved in October 1950, and helped convince President Truman to authorize the blasts. Numerous test holes were drilled at Amchitka, but the project was postponed due to cost, publicity and radiation concerns.[448] Plans for testing on Amchitka were revived in 1963, as the U.S. cast increasingly farther afield for appropriate test sites for its ever more powerful nuclear weapons. The test ban treaty of 1963 meant that Amchitka would only have an underground detonation, since all others were banned.[449]

***Amchitka 2**

In October 1965, the Department of Defense and the AEC detonated an eighty-kiloton nuclear warhead at 2,300 feet below Amchitka's surface. The test was known as Long Shot. The next two detonations were progressively larger. Milrow, in October 1969, was a one-megaton explosion at 4,000 feet. In November 1971, Cannikin, the largest underground nuclear test in U.S. history, was detonated 5,875 feet below the surface with a yield approaching five megatons. The last test was conducted by the AEC alone. Six other sites on the island were considered for potential test shots, and two holes were dug. These were later backfilled, and no further testing took place due to overwhelming congressional and public opposition.[450]

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[446] Hedman, William, and Charles Diters. *The Legacy of Project Chariot*. Anchorage, AK: Alaska Department of Natural Resources, Office of History and Archaeology, n.d., 2–10.

[447] Kohlhoff, Dean W. *"Amchitka and the Bomb—Nuclear Testing in Alaska"* Seattle: University of Washington Press, 2002, 11–12.

[448] Kohlhoff, 32–37. As early as 1950, when the Navy began test-drilling, the manager of the Aleutian Islands Refuge, Robert Jones, became incensed at the thought of his beloved island being used for nuclear testing. Mr. Jones' ire was but the opening salvo in a long-running environmental struggle.

[449] Kohlhoff, 54–55.

[450] As conflict between proponents of nuclear testing and the environmentalist community heated up, the AEC hewed to the position that nuclear testing was vital to national security and was harmless at any rate. The environmentalist group Greenpeace in turn

***Amchitka 3**

The U.S. Department of Energy (DoE), successor to the AEC, was responsible for the site in 2012. DoE studies, beginning in 2001, revealed low-level tritium isotope contamination (within federal standards for drinking water), but no further nuclear pollutants. The site was contaminated, however, by the drilling mud used for the holes, which was saturated with diesel fuel. DoE commenced reclamation of the area in 2001.[451]

SM-1A Nuclear Reactor, 1962–1972

Peaceful uses of atomic devices were hardly limited to creative explosions. Far more practical and widespread was the nuclear power reactor. The AEC, in its quest to promote the feasibility and desirability of a peaceful nuclear world, needed partners to develop its ideas. The U.S. Army desired an air-portable nuclear reactor that could be transported to remote locations and, in 1954, entered into an agreement with the AEC to develop a prototype.[452] A successful example, active in April 1957, was built at Fort Belvoir, Virginia. The Stationary Medium Power Reactor (SM-1) was state of the art, and used advanced safety precautions. The next step was to actually build and use the SM-1 in a remote location where power was expensive. In 1958, Secretary of the Army William M. Brucker announced that the next Army reactor would be built at Fort Greely, Alaska.[453]

***SM-1A 1**

Construction was bid to Peter Kiewit & Sons of Seattle, who in turn subcontracted to nuclear power expert ALCO. The initial fuel requirement was 14 pounds of U-235, equivalent to three million gallons of fuel oil, which would last the reactor one year. In its ten-year lifespan, the reactor consumed four of these fuel cores. The reactor came online on 13 March 1962 and was operated until 1964 by the Army Nuclear Power Field Office. The Army Engineer Reactors Group took over in July 1964. Twenty-three personnel ran the reactor.[454]

The Fort Greely SM-1A, the largest nuclear power plant in Army hands in 1962, was a pressurized water system. The fission process created heat, which raised the temperature and pressure of water in a closed system. This in turn boiled more water, which produced steam. The steam drove a turbine, creating electricity. Through a system of pipes, the steam also heated buildings at Fort Greely. Highly radioactive fuel cores were sent to disposal facilities in the contiguous U.S. Initially, radioactive water waste was dumped into nearby Jarvis Creek. From March 1968 until the reactor closed, radioactive water was evaporated and ionized onsite to remove radioactive solids, which were then sent to Hanford, Washington. The remaining liquid was poured into a well at Fort Greely, often in amounts exceeding the AEC's minimum radioactivity standards.[455]

The SM-1A was built as a test study only, but served Fort Greely's power needs for ten years. The reactor was decommissioned in 1972 and its highly radioactive material removed to the Lower Forty-Eight. The reactor housing, designed to last 150 years, was encased to prevent radiation seepage, pending final disassembly in 2023. The SM-1A was the first American nuclear reactor to be decommissioned. It provided nuclear engineers a wealth of information on how to decommission other sites around the country.[456]

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compared its anti-Cannikin protest to a famous World War II battle, and asserted "angels and bat-beings were locked in a deadly, groaning embrace." Kohlhoff, 100.

[451] Amchitka, Alaska, Site Fact Sheet. U.S. Department of Energy Office of Legacy Management, 20 December 2011. http://www.lm.doe.gov/Amchitka/Sites.aspx. Accessed July 2012.

[452] Johnson, 61.

[453] Pamphlet 360-5, 1965, 91.

[454] Johnson, 65–67.

[455] Johnson, 73.

[456] Johnson, 78.

***SM-1A 2**

Despite its optimistic 150-year lifespan, the reactor casing cracked in several places within 20 years. The Army had repaired the cracks by 1993, and extensive remediation followed, including the removal of over 500 cubic yards of soil. In 2004, the only significant radioactive isotope remaining in the soil was Strontium-90, in concentrations slightly higher than the maximum allowable contaminant level.[457]

***SM-1A 3**

Cold Weather Testing and Arctic Research

All the Armed Services conducted cold weather testing and arctic research during the Cold War. The Air Force's Cold Weather Test Detachment and Arctic Aeromedical Laboratory tested planes, equipment, and personnel, striving constantly to perfect cold weather air operations and the people who performed them. The Navy's Arctic Research Laboratory performed a wide range of experiments. The Army used Fort Greely and its environs to not only conduct cold weather experiments but to train its personnel in arctic and mountain warfare techniques.

Naval Arctic Research Laboratory (NARL), 1948–1980

The Arctic Research Laboratory (ARL) was established at Barrow, Alaska, in 1948 by the Office of Naval Research. For the first five years of its existence, it supplemented the Navy's PET-4 oil exploration program. In 1953, the Air Force took over NARL's logistical support.[458] ARL was renamed the Naval Arctic Research Laboratory in 1967. NARL's stated mission was "research in all appropriate scientific fields related to the Arctic environment."[459] Affiliated scientists investigated work and survival-related issues, auroral phenomena, geomagnetism, geomorphology, permafrost, sea ice, and a plethora of military-specific topics. While NARL supported the Cold War military effort, it welcomed any government-sponsored research. Hundreds of scientists from all over the United States and Canada visited NARL. Over 60 separate research projects were underway in summer 1963 alone.[460] Its projects were invaluable to American efforts in the Cold War. One scientist asserted, "results from the research of a single permafrost program at the Arctic Research Laboratory enabled savings in the cost of construction of the Distant Early Warning line greater than all the money spent on the ARL in its entire history."[461]

***NARL 1**

The Arctic Research Laboratory was not limited to its home base at Barrow. Its researchers performed experiments all over northern Alaska, including the Ogotoruk Creek site designated for Project Chariot. NARL scientists also worked at four drifting ice stations, coincident with the Air Force's Project Ice Skate.[462] NARL closed its doors in 1980 and relinquished its facilities to the Ukpeagvik Inupiat Corporation, which in turn

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[457] Alaska Department of Environmental Conservation, Spill Prevention and Response, Contaminated Sites Database, Cleanup Chronology Report for Fort Greely SMDC Nuclear Reactor SM1A. http://www.dec.alaska.gov/Applications/SPAR/CCReports/Site_Report.aspx?Hazard_ID=1706. Accessed July 2012.
[458] "Arctic Research Laboratory." Washington, D.C.: Office of Naval Research, Department of the Navy, 1955, 1.
[459] Hummel, *Alaska's Militarized Landscape*, 54.
[460] Britton, Max. "ONR Arctic Research Laboratory." *BioScience* 14, no. 5, Arctic Biology (May 1964), 44–48, 47.
[461] Reed, John C. "The Story of the Naval Arctic Research Laboratory." *Arctic* 22, no. 3 (1969), 177–183. http://arctic.synergiesprairies.ca/arctic/index.php/arctic/article/view/3211/3187. Accessed July 2012.
[462] Hummel, *Alaska's Militarized Landscape*, 55.

leased them to Ilisagvik College and the Barrow Arctic Science Consortium.[463] In 2012, the Navy appropriated funds to revive its arctic initiatives, citing the emerging relevance of a melting Arctic.[464]

***NARL 2**

Fort Greely, 1955-Present

Fort Greely was the Army's third largest Alaskan base during the Cold War. Founded 30 June 1942 as Station 17 of the Air Transport Command's Alaskan Wing, it was renamed Big Delta Post in 1948. In 1955, upon closure of the fort of the same name at Kodiak, it assumed its final name, Fort Greely.[465] Greely's *raison d'être* was research and training to prepare men and equipment for Cold War combat. Its mission remained essentially constant throughout the Cold War: to guard the military airfield, support the cold weather testing and training operations, support troops assigned to the post for other missions, and guard communications centers.[466] Its vast maneuver areas were used in numerous exercises, an experimental nuclear reactor powered the base for ten years, and its cadre researched better methods of cold weather warfare and trained soldiers.

Operations at Fort Greely primarily comprised training and research. The first of Greely's warfare schools was the Army Arctic Indoctrination School (AAIS), established in 1949 to facilitate the Army's mission of developing training and operational readiness.[467] In 1957, the AAIS was renamed the Cold Weather and Mountain School. In 1963, pursuant to the Army's decision to train entire units at a time rather than individual soldiers, AAIS became the Northern Warfare Training Center (NWTC). NWTC was one of the Army's few national warfare-training centers,[468] along with the National Training Center at Fort Irwin, California, and the Joint Readiness Training Center at Fort Polk, Louisiana.

Throughout the Cold War, between three and five thousand soldiers a year flew to Fort Greely for short tours. Instruction included weeks-long waterways navigation courses, winter operations, ski instructor training, and mountain warfare skillbuilding. The NWTC survived the Cold War and Fort Greely's temporary closure and in 2012 was headquartered at Fort Wainwright, with a detachment at the old NWTC training camp of Black Rapids.[469]

***Greely 1**

The Arctic Test Branch was established in 1949 at Fort Greely. It was supplanted by the Arctic Test Center in 1964.[470] The test center had six divisions headquartered at Fort Greely. The research and development office and special projects division were detached to Fort Wainwright. One of several Army cold weather research programs in the Cold War, the test center frequently supported other civilian and military agencies in their research and field-testing. It was renamed the Cold Regions Testing Center (CRTC) in 1976. 1994 saw CRTC fall under the authority of the Yuma Proving Ground. Further change came in 1995, when the BRAC slated

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[463] Hummel, 139.
[464] Stewart, Paul. "Naval Research Laboratory Arctic Initiatives." Washington, D.C.: Naval Research Laboratory, 2012. www.star.nesdis.noaa.gov/star/documents/meetings/.../Stewart.pdf. *Accessed* July 2012.
[465] Both Forts Greely were named after Major General Adolphus Washington Greely, whose Arctic credentials included the disastrous Lady Franklin Bay expedition to Ellesmere Island in 1881 and oversight of the WAMCATS project that connected Alaska with the outside world.
[466] Mobley, Charles M. *Historical Overview and Architectural Inventory of Fort Greely, Delta Junction, Alaska*. Anchorage, AK: Charles M. Mobley Associates, 1998, 32.
[467] *The Cold War Historic Context of Fort Wainwright and Ladd Air Force Base,* 3-12.
[468] Denfeld, *The Cold War in Alaska*, 286.
[469] Northern Warfare Training Center, Fort Wainwright, Alaska. http://www.wainwright.army.mil/nwtc/, accessed July 2012.
[470] *The Cold War Historic Context of Fort Wainwright and Ladd Air Force Base*, 3-15.

Fort Greely for closure. CRTC moved to Fort Wainwright, where it stayed until 2005. In 2012, CRTC was headquartered at Fort Greely, with a rocket storage facility at Fort Wainwright.[471]

***Greely 2**

The most unusual of Fort Greely's Cold War activities was the testing of chemical weapons. Between 1962 and 1967, the U.S. Army Chemical Corps Arctic Test Activity conducted emplacement and dispersion experiments. Researchers used field trials and laboratory analysis of agents and munitions to determine their feasibility for use in varied Arctic terrain. The weapons included GB and VX nerve agents, and BG-1 and BG-2 biological stimulants. Unlike the Amchitka nuclear blasts and the proposed harbor at Cape Thompson, the Gerstle River operations were classified and occasioned almost no public comment.[472] The 78,000 acres used for testing were leased from the State of Alaska and the Bureau of Land Management in the early 1960s, and remitted to them between 1970 and 1972.[473] A forest fire in 1994 prompted the Chemical Biological Defense Command to test the area for airborne chemical warfare material and initiate cleanup of possible unexploded ordnance.[474]

The U.S. Army Research Institute of Environmental Medicine (USAREIM) did further Army cold weather testing at Fort Wainwright. USAREIM was the Army's equivalent to the Air Force's Arctic Aeromedical Laboratory and studied cold weather injuries. Another longtime Army cold weather research operation was the Cold Regions Research and Engineering Laboratory, headquartered at Natick, Massachusetts, with a satellite office at Fort Wainwright. CRREL, still in existence in 2012, studied permafrost extensively in the Fairbanks area.[475]

Troops at Big Delta Post from 1949 until 1953 made do with temporary World War II airfield buildings. Fort Greely proper was constructed between 1953 and 1954. The construction program included post headquarters, engineer facilities, an auditorium, fire station, warehouses, power plant, shops and barracks, a library, a dispensary, and the CWMS facilities. An expansion in 1955 gave Fort Greely a PX and theater, a gymnasium and a service club. More facilities arrived in the late 1950s and early 1960s,[476] among them barracks and storage for the short-lived MIDAS operation at nearby Donnelly Flats.[477]

***Greely 3**

Fort Greely survived the Cold War, but only barely. In the 1995 BRAC, it was "warm based," and its personnel and missions were sent elsewhere. In 2001, Greely was revived to serve as part of the Air Force's Ground-Based Midcourse Defense (see the Cobra Dane segment of this document). Its training areas were given to Fort Wainwright, paring Greely to a lean 7,200 acres. In 2012, it continued the mission of ballistic missile defense and had reacquired its traditional tenants, the CWTC and NWTC.[478]

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[471] U.S. Army Cold Regions Test Center: The Defense Department's Natural Cold Environment Tester. http://www.crtc.army.mil/history.asp. Accessed July 2012.
[472] In his unpublished "The Dragon Goes North: Chemical and Biological Warfare Testing in Alaska," political scientist Richard A. Fineberg attempted to draw public attention to the 1969 discovery of several unexploded nerve gas rounds found at the bottom of a freshly-drained lake. The Army admitted that the shells had been placed on the lake's frozen surface preparatory to disposal, and had apparently been forgotten—during which time the ice melted and the shells disappeared from sight and memory. Fineberg's manuscript can be found at http://arcticcircle.uconn.edu/SEEJ/NMD/alaska/greely/fineberg/index.htm.
[473] Dames & Moore. "Gerstle River Expansion Area, Project Number F10AK098404." Huntsville, AL: U.S. Army Corps of Engineers Ordnance and Explosive Waste (OEW) MCS and Design Center, September 1994, 1, 4.
[474] Dames & Moore, 10–11.
[475] *The Cold War Historic Context of Fort Wainwright and Ladd Air Force Base*, 3-15–3-17.
[476] Denfeld, *The Cold War in Alaska*, 285–286.
[477] Price, *The Donnelly Flats MIDAS Station*, 48.
[478] Greely.Army.Mil: The Official Website of United States Army Garrison Fort Greely, "History of Fort Greely." http://www.greely.army.mil/about/history.aspx. Accessed July 2012.

Conclusion

The years since the end of the Cold War have been ones of major change for the military in Alaska. The early 1990s saw the closure of multiple smaller military installations in Alaska, among them the newly renamed Eareckson Air Force Base at Shemya and the Forward Operating Bases at Galena and King Salmon.[479] Fort Greely and the Adak Naval Operating Base were closed by 2000. But the military's presence in Alaska has hardly dwindled. While military planners after the Cold War were chiefly concerned with drawdown of forces, the Global War on Terrorism has given new life to Alaskan military installations. The BRAC of the 1990s seems, a few years later, like a slump rather than the end of an era. The major military activities are training for war and deployment to combat zones. However, as military environmental consciousness increases, the ArmedServices continue their cleanup efforts and demolition of closed AC&W, White Alice, and DEW Line stations. While the broader historic context of the Cold War in Alaska remains incomplete, the intervening 20 years have seen a wealth of new material brought to light and inaugurated a new era of cooperation between the military and cultural resources organizations. One need only to look at the attempts to save Nike Site Summit to find the Army and the State Office of History and Archeology working together to preserve their common heritage.

Military and civilian offices in Alaska have studied the Nike Hercules facilities, the White Alice Communications System, the DEW Line, all the major military installations, and many more. There are also studies that provide an overview of the different DoD entities in Alaska. Most of these studies were done to comply with the National Historic Preservation Act of 1966 (as amended).

Unlike the other studies, *The Coldest Front* considers the Cold War systems in Alaska in terms of function and technology. This document in its amended form will give cultural resources personnel a framework in which to understand the individual sites and systems they evaluate, a means of understanding that those weatherworn buildings and decaying foundations are more than just relics of another time. They represent an era of unprecedented technological growth and competition, a struggle for survival against an enemy many believed would take over the world.

[479] Fried, Neal. "Defense: Still One of Alaska's Biggest Exports." *Alaska Economic Trends*, September 1996, 16.

Timeline

1946		
	February 22	George F. Kennan sends his Long Telegram
	March 5	Winston Churchill gives his Iron Curtain speech at Fulton, Missouri
	March	Army Air Force establishes Air Defense Command as part of operational command with Strategic Air Command and Tactical Air Command
	October 1	Alaskan Air Command relocates from Davis Air Force Base, Adak, to Elmendorf Air Force Base, Anchorage
	October	Joint Chiefs of Staff develop the polar concept
		Hoge Board recommends 36 AC&W sites in Alaska
	November	Task Force Frigid and Task Force Williwaw, first large-scale cold weather training in Alaska, conducted at Blair Lakes near Ladd AFB, and Adak, respectively, November 1946-March 1947
1947		
	January	Joint Chiefs of Staff establish Alaskan Command (ALCOM), with subordinate commands AAC (Alaskan Air Command), USARAL (U.S. Army Alaska) and ALSEAFRON (Alaskan Sea Frontier) established by year's end
		USAF develops Supremacy Plan for a system of radar sites across the U.S. and Alaska
		Emergency War Plan directs that SAC bombers be stationed in Alaska
	September 18	United States Air Force officially separates from United States Army
1948		Berlin Crisis
		Mile 26 Field near Fairbanks is lengthened and renamed Eielson Field, one of only four in the U.S. capable of launching B-36 Peacemaker bombers
		Naknek Field (renamed King Salmon in 1954) becomes a forward operating base
	May	New Army Arctic Indoctrination School starts at Station 17, ATC (Big Delta Army Air Field)
1949		Soviet Union tests atomic bomb
	September 2	Eielson-based aircraft detects first Soviet nuclear test

1950		
	April	National security analysis study NSC-68 recommends military provide an adequate defense against air attack on the U.S.
	June 25	Korean War starts
	October 15	Fort Richardson officially separates from Elmendorf AFB
1951		AC&W stations begin operation
	March	Galena opens as a forward operating base
		Air Force study East River concludes that civil defense measures alone would be nearly futile against atomic weapons
		MIT's Lincoln Laboratories' Summer Study Group proposes DEW Line and its Project Charles recommends computerization of air defense systems
1952		Anchorage and Fairbanks receive antiaircraft artillery gun batteries
1953		MIT's Lincoln Laboratories prepares Wizard 3 studies that lead to development of BMEWS
	March 15	Soviet MiG-15 fighters fire on U.S. WB-50 weather aircraft near the Kamchatka Peninsula
1955		White Alice communications stations start operating, officially complete by 1958
		Big Delta Airfield renamed Fort Greely
		Marks AFB at Nome is closed after a three year phase-out
	July 31	DEW Line starts operating, officially complete by 1957
	October 12	Haines-Fairbanks ALCANGO (Alaska-Canada Gas and Oil) Pipeline completed
1957	October 4	Soviet Union launches *Sputnik* satellite
		Canada and the U.S. create the North American Aerospace Defense Command (NORAD) housed inside a mountain at Colorado Springs
1958	January 31	U.S. launches *Explorer I* satellite
	March 5	Radar tracks first known Soviet long-range bombers flying a reconnaissance mission over Alaska

	August	Air Force begins construction of BMEWS station at Clear, becomes operational in 1961
		Atomic Energy Commission selects Cape Thompson as a Project Plowshare site and proposes Project Chariot to use nuclear power to create a deep-water harbor; abandons project in 1962
1959		Nike Hercules batteries at Anchorage and Fairbanks replace AAA batteries Nike Site Peter is the first in Alaska to test fire its missiles
	January	Alaska becomes the 49th state
	April	Aleutian DEW Line stations start operating
1961		Communists construct the Berlin Wall
	January 1	Ladd AFB handover to USARAL, renamed Fort Jonathan Wainwright
		Aircraft from Galena FOB make first visual intercept of Soviet aircraft above Bering Sea
1962		Cuban Missile Crisis
1964		Good Friday Earthquake devastates Anchorage, Valdez, U.S. military aids in recovery efforts
1965		Air Force contracts with Federal Electric Company to operate DEW Line
	November 29	Atomic Energy Commission conducts 80-kiloton underground nuclear test, Long Shot, the first of three on Amchitka Island
1967		Chena River floods Fairbanks and Fort Wainwright, U.S. Army aids in recovery efforts
1971		ALSEAFRON dis-established
1973		Advent of satellite communications, White Alice stations now obsolete
		Department of Defense begins building Cobra Dane radar system on Shemya Island, operational by 1977
1974		USARAL disbanded
1975		ALCOM dissolved

1983		NORAD Region Operations Control Center at Elmendorf Air Force Base becomes operational
		President Reagan proposes Star Wars strategic defense initiative
1984		Minimally Attended Radars become operational
1985		U.S. and Canada sign North American Air Defense Modernization Accord
1989		
	July	Alaskan Command (ALCOM) reestablished, under Pacific Command (PACOM) Alaskan Air Command (AAC) redesignated 11th Air Force
	August 6	First Soviet military aircraft since World War II land at Elmendorf AFB, en route to a Canadian air show
	November	Berlin Wall dismantled
1990	2 August	Operation Desert Shield begins, Persian Gulf War
	December	Soviet Union officially dissolved
1991	17 January-28 February	Operation Desert Storm, Persian Gulf War
1992		Cope Thunder exercises move to Eielson AFB, renamed RED FLAG-Alaska in 1996
1993		USARAK formed
1994		Eielson AFB hosts Exercise SAREX 94, featuring U.S., Russians and Canadians
2001		
	September 11	Terrorist attacks on World Trade Center and other targets
	7 October	Operation Enduring Freedom begins. United States and NATO forces invade Afghanistan, Alaskan forces deploy multiple times
2003	20 March	United States and NATO forces invade Iraq, inaugurating Operation Iraqi Freedom, Alaskan forces deploy multiple times

Glossary of Acronyms

AAA Anti-Aircraft Artillery
AAC Alaskan Air Command
ABM Anti-Ballistic Missile
AC&W Aircraft Control and Warning
ACS Alaska Communications System
ADC Alaska Defense Command
AEC Atomic Energy Commission
AFB Air Force Base
AFSS Air Force Security Service
ALCOM Alaskan Command
ASA Army Security Agency
AWACS Airborne Warning and Control System
BMDS Ballistic Missile Defense System
BMEWS Ballistic Early Warning System
CINCAL Commander in Chief, Alaskan Command
CINCPAC Commander in Chief, Pacific Fleet
CAA Civil Aeronautics Administration
CONAD Continental Air Defense Command
DEW Distant Early Warning
DEWIZ DEW Line Identification Zone
DoD Department of Defense
EIS Environmental Impact Statement
FEC Federal Electric Company
GCI Ground Control Intercept
GMD Ground-based Midcourse Defense
GOC Ground Observer Corps
GOR General Operating Requirement
ICBM Intercontinental Ballistic Missile
IOC Initial Operating Capability/Capacity
IRBM Intermediate Range Ballistic Missile
JSS Joint Surveillance System
MAD Mutual Assured Destruction
MAR Minimally Attended Radar
MIDAS Missile Defense Alarm System
NORAD North American Air Defense Command
NSC National Security Council
PACOM Pacific Command (Air Force)
POL Petroleum, Oil and Lubricants
ROCC Regional Operations Command Center
SAC Strategic Air Command
SOSUS Sound Surveillance System
SPADOC Space Defense Operations Center
SRF Strategic Rocket Forces (Soviet)
SAGE Semi-Automatic Ground Environment
TACAN Tactical Air Navigation
UHF Ultra High Frequency
USAF United States Air Force
USUSAGAK United States Army Garrison Alaska

USARAK United States Army Alaska, 1994-present
USARAL United States Army in Alaska, 1947–1974
USCG United States Coast Guard
USN United States Navy

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Cold War Military Historic Properties and Contexts

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In 2010 the Seward Peninsula public protested against the proposed destruction of the Anvil Mountain White Alice site's signature billboard antennas. The Air Force had planned to remove the towers as part of ongoing Cold War site remediation.

"Relocatable Over-the-Horizon Radar (ROTHR) for Homeland Security." Tewkesbury, MA: The Raytheon Company, May 2004.
http://www.raytheon.com/capabilities/products/stellent/groups/public/documents/legacy_site/cms01_049201.pdf, accessed June 2012.
Raytheon's information sheet on ROTHR focuses on capabilities and deployment locations, and includes excellent graphics demonstrating the radar's coverage.

"Reorganization of the 25th Infantry Division." 25th Infantry Division Association, 30 October 2010,
http://www.25thida.org/divreorg.html. Accessed July 2012.
The 25th Infantry Division Association's website chronicles the changes to the division's structure following the 2004–2005 Army Modernization Plans. The 25th was restructured into a group of modular brigades under independent command.

Rigge, Simon. *War in the Outposts*. Chicago: Time-Life Books, 1980.
Part of Time-Life's series on World War II, *War in the Outposts* contains an overview of the Lend-Lease Act and its protocols.

State of Alaska, Department of Labor and Workforce Development, Research Analysis. Annual Components of Population Change for Alaska, 1945–2011. http://labor.alaska.gov/research/pop/popest.htm, accessed June 2012.

Stewart, Paul. "Naval Research Laboratory Arctic Initiatives." Washington, D.C.: Naval Research Laboratory, 2012.
www.star.nesdis.noaa.gov/star/documents/meetings/.../Stewart.pdf. Accessed July 2012.
The Navy, cognizant of climate change and the resulting change in the strategic climate, refunded Arctic research in 2012. The PowerPoint presentation builds on NARL's successes and includes a brief photographic history.

Sullivan, Leonard J., S.J. *The United States and Greenland During World War II*. Master's Thesis, San Francisco: University of San Francisco Press, 1967.
Greenland occupied an unusual position in World War II. Its governors broke with the Danish crown following the German occupation of Denmark and asked the United States to protect them. The U.S. built several air bases on Greenland, most notably Thule AB, which would play a major role in the Cold War.

Transcript of Lend-Lease Act. http://www.ourdocuments.gov/doc.php?doc=71&page=transcript. Accessed June 2012.

U.S. Air Force. "Northern Edge Participants Complete Successful Exercise. 29 June 2011.
http://www.af.mil/news/story.asp?id=123262013. Accessed 11 July 2012.
The Air Force press release details 2011's Exercise Northern Edge, the successor to the Jack Frost/Brim Frost series.

United States Department of Commerce, Bureau of the Census. *Sixteenth Census of the United States: 1940. Population: Characteristics of the Population (with limited data on housing): Alaska*. Washington: United States Government Printing Office, 1943.

United States Department of Defense Missile Defense Agency, "Elements: Ground-based Midcourse Defense." 23 March 2012, http://www.mda.mil/system/gmd.html. Accessed May 2012.
In-depth explanation of the Ground-Based Midcourse Defense system which incorporated Cobra Dane in the 2000s.

United States Department of the Interior District Land Office, 8 August 1941.
What is now the Tanana Flats Training Area was set aside by Executive Order 8847 in 1941.

United States General Accounting Office. Report to the Ranking Minority Member, Subcommittee on Financial Management, the Budget, and International Security, Committee on Governmental Affairs, U.S. Senate. "Missile Defense: Additional Knowledge Needed in Developing System for Intercepting Long-Range Missiles." Report GAO-A3-600, August 2003. http://www.gao.gov/products/GAO-03-600. Accessed May 2012.
The General Accounting Office recommends that procedures be established to test the Cobra Dane radar system, and to ensure reliability of Missile Defense Agency data.

Appendix A: Alaskan Historic Preservation Documents

Blythe, Jeff. *Cold War Resources Inventory United States Army Alaska: Fort Richardson, Fort Wainwright, Fort Greely*. Fort Collins, CO: Center for Ecological Management of Military Lands, Colorado State University, December 2000.
The report is an inventory of physical and literary properties and relics associated with the U.S. Army Alaska's Cold War heritage. Its purpose is to identify potentially significant Cold War properties on the major Army installations and evaluate their historic significance.

The Cold War Historic Context of Fort Wainwright and Ladd Air Force Base, 1946–1991. Anchorage, AK: CH2M Hill, Inc., and Northern Land Use Research, Inc., July 2007.
A mix of property type analysis, military history and general background.

Denfeld, D. Colt. *The Cold War in Alaska: A Management Plan for Cultural Resources, 1994–1999*. U.S. Army Corps of Engineers Alaska District, 1994.
Denfeld's management plan is to date the only comprehensive study of Alaskan Cold War properties regardless of service. The resource is invaluable, but information was scantier in 1994 and the status of many properties has since changed.

Inventory and Evaluation of Military Structures at Fort Greely, Delta Junction, Alaska. U.S. Army Corps of Engineers, Alaska District, April 1999.
The report includes the historic overview, building descriptions and histories, and results of the evaluation of 208 buildings at Fort Greely, including Historic American Building Survey Level IV Recordation forms.

Salmon, John S. Protecting America: Cold War Defensive Sites. A National Historic Landmark Theme Study. Washington, D.C. National Park Service, October 2011.
Salmon's work, still a draft as of summer 2012, is a potential asset to any cultural resources or architectural history office. Addressing individual property types and placing them in context, he sets the scene with a rousing account of the Cold War guaranteed to engage any reader.

"Site Summit Retention Plan, Fort Richardson, Alaska." Anchorage, AK: CH2M Hill, August 2010.
The 2009 Site Summit Programmatic Agreement between the Army, the Alaska State Historic Preservation Office, the National Park Service, and the Advisory Council for Historic Preservation identifies procedures for the U.S. Army Garrison, Alaska to follow for building demolition and retention.

Spenneman, Dirk HR. *The Cultural Landscape of the World War II Battlefield of Kiska, Aleutian Islands*. *Findings of a cultural heritage survey, carried out in June 2009.* Albury, NSW, Australia: Institute for Land, Water and Society, Charles Sturt University, 2011.
Spenneman's exhaustive inventory and history of the Kiska battlefield includes an entire chapter on its historic significance.

Whorton, Mandy, Gustavious Williams, and Alan M. Alpert. *History of Alaska's Forward Operating Bases (FOBs): The Soviet Bomber Threat and North American Air Defenses during the Cold War*. Argonne, IL: Environmental Assessment Division, Argonne National Laboratory, April 2001.
Whorton et al focus on construction, building types, and base life, and include a table of Cold War historic properties at the Galena and King Salmon National Historic Districts.