Chapter Two

THE ALASKA DISTRICT AND THE MILITARY CONSTRUCTION MISSION

POST-WAR ORGANIZATION

At war's end, there were two authorities responsible for the direction of Engineer activity in Alaska--the Seattle District and the Engineer of the Alaskan Department. The Seattle District supervised civil works in the Territory and reported to the North Pacific Division headquartered in Portland, and through that organization to the Chief of Engineers in Washington. Military construction, on the other hand, was controlled by the Engineer of the Alaskan Department (with support services provided by the Corps' Seattle District organization). This Department Engineer was responsible in his turn to the commanding general of the Alaskan Department. Ultimately, of course, this dual chain of command culminated in the War Department.

In January 1946, while the nature and scope of the post-war military construction program were under discussion, the War Department informed the Commanding General, Alaskan Department, that it was considering the transfer of military construction in overseas areas (including Alaska) to the Corps of Engineers organization. It was proposed to handle this transfer by creating a new Engineer District in Alaska. When asked to comment on this proposal, the Department Engineer, Col. James Lang, pointed out that demobilization had seriously reduced the Department's staff of key military and civilian personnel. Despite this difficulty, he was confident that there was a sufficient personnel nucleus on which to build a rudimentary District organization. [1] In March 1946, the North Pacific Division Engineer also submitted his observations on the proposal. Noting the small nucleus of employees available in Alaska, he supported the creation of a new Engineer District in the Territory with the proviso that its work be confined to military construction and the Seattle District retain its responsibility for civil works. [2]

On 9 April 1946, the War Department approved the proposal to establish an Alaska Engineer District with the proviso suggested by the North Pacific Division. This approval was embodied in General Order Number Six (see Appendix A). Colonel Lang was to move from his position as Department Engineer to the new post as District Engineer for Alaska within the Corps organization.

The facilities available to the new District Engineer were, to say the least, modest. Colonel Lang had hoped to use an Army building in Anchorage for his office but this turned out to be impossible. He was forced to settle on Fort Richardson using two mobilization-style wooden buildings loaned to him by the Department authorities. Lang was severely hindered in his attempts to build up a staff not only by financial difficulties but also a severe housing shortage both on the post and in the City of Anchorage. For a considerable time, District personnel, including families, all lived in tarpaper covered temporary structures with unreliable heating and plumbing. This situation contributed directly to one of the District's most nagging problems in the early years of its existence--a constantly high rate of turnover in personnel, sometimes as high as eighty percent in a single year.[3]

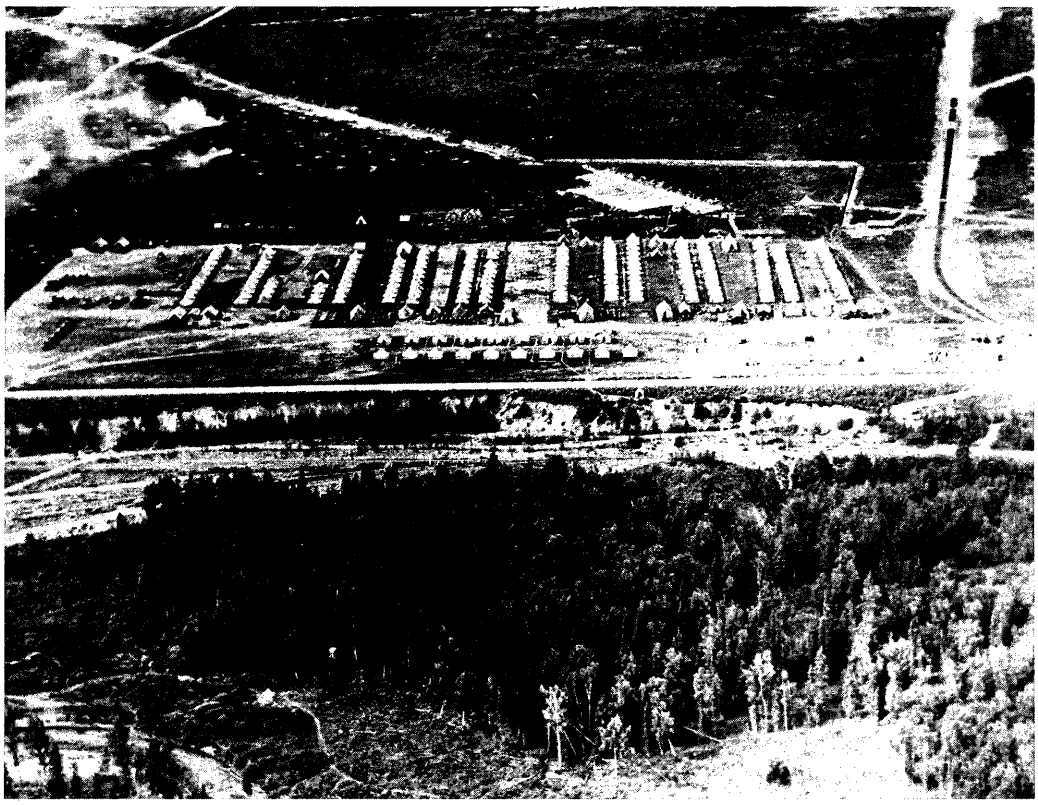
Lang had no sooner gotten the new District underway when the War Department began a complex process of reorganization of the Alaskan military establishment which ultimately had considerable impact on the operation of the District. Within the Alaskan Department, two separate command structures were formed--the Alaskan Air Command and the Alaska Service Base. In January 1947, the government formed the Alaskan Command (ALCOM), the first "unified command" in the nation. That is, the ALCOM commander was charged with the coordination of all military activities in Alaska including ground, air, and naval forces.

In the summer of 1947, Congress passed the National Security Act creating a unified Department of Defense under which were established three new co-equal Departments for the Army, Navy, and Air Force. The Department of the Army issued orders in November which abolished the wartime Alaska Department and created in its place USARAL (the United States Army, Alaska). These orders also included the separation of the Alaskan Air Command which now reported directly to the Air Force chain of command which culminated in the Department of the Air Force.

While all of these large changes were taking place, something of the wartime arrangements concerning the Engineer function was resurrected. While Colonel Lang was to report to the North Pacific Division, the general military construction program was to be determined by the commanding general of the Alaskan Department. With the abolition of the Department, this prerogative passed to the commander of the Alaskan Command. The relationship between the District Engineer and ALCOM's commander somewhat resembled the war-time arrangement made between Colonel Talley and General Buckner in 1941.

In total, these new arrangements had a considerable impact on the local District organization. It now had two administratively independent superiors--the North Pacific Division organization and the ALCOM commander (referred to as Commander in Chief Alaska, or CINCAL). At the same time

it served two administratively independent customers -- the new USARAL and the Alaskan Air Command.



Army camp at original Fort Richardson (now Elmendorf AFB) when construction started in 1940.

SCOPE AND NATURE OF THE MILITARY CONSTRUCTION PROGRAM

A number of major factors shaped the formation of military policy for Alaska in the fifteen year period following the end of World War II. The region, because of climate and terrain, was plainly not suited for large scale mobile ground warfare of the sort encountered on the plains of Europe during the second World War. During the war, General Buckner, an Army officer, had seen that fact straightaway and had set himself to

the task of building an Air Force in Alaska and the facilities needed to sustain it. Ground forces in the territory had been accumulated for two reasons--to defend the air and naval bases, and ultimately to participate in the combined amphibious operations necessary to expel the Japanese from the Aleutians. Following the war, ground troops virtually disappeared from Alaska. But as the cold war began to take shape, particularly during the Korean conflict, ground forces were gradually built up again in the Territory for purposes of installation defense.

The second major element in the evolution of military policy in Alaska was the development of the theory and practice of aerial warfare. The use of long-range aircraft and the development of nuclear weapons to be carried by them was paralleled by the growth of international tension between the United States and the Soviet Union. For Alaska, in the period from the end of the war down to the late fifties, this meant new importance as a potential base from which nuclear weapons might be delivered to the Soviet Union.

Still a third element entered the post-war situation. By the early fifties, the American monopoly on nuclear weapons had vanished; the Russian possession of these devices and the aircraft able to carry them to the United States clearly indicated need for advanced early warning and air defense systems. This development produced a shift in Alaskan policy resulting in a new role as an advanced warning and interception base. Alaska's role in the national early warning system took on still more importance as the burden of strategic nuclear warfare passed from the airplane to the guided missile.

The last important general influence on the military presence in Alaska was the requirement of mobilization and support for American military forces operating in Asia, first in Korea and then in Indochina. Alaska served as an important link in the movement of men and material to those theatres.

These developments in Alaskan military policy directly affected the military construction mission of the newly formed Alaska District. At the outset, the District concentrated on the expansion and improvement of facilities built during the war and the development of bases for the strategic air arm. In the period from 1950 to 1961 great emphasis was placed on the development of new facilities for the Army and Air Force. In addition, the District became deeply involved in the construction of early warning systems and the communications networks necessary for their successful operation. By the early sixties the greatest amount of the construction of the infrastructure for a permanent military establishment was completed. There was, however, a temporary revival of military construction associated with the rehabilitation of facilities following the 1964 earthquake and the need to support the military activity required by the war in Indochina.

Many of the general problems encountered by military engineers in war-time construction in Alaska continued to exist in the post-war period. Weather, terrain, permafrost, and muskeg presented their usual difficulties. One of the most formidable problems faced by the District was to secure civilian contractors of sufficient organizational size and experience to handle construction of the scope envisioned by higher authorities. During the war this problem had been handled by using outside contractors in addition to line troops and military construction equipment. In the immediate post-war period, similar solutions were employed.

When the Alaska District was formed, the Chief of Engineers ordered the North Pacific Division to select a combination of contractors willing and able to do work on the scale required. Similar arrangements were to be made with an Architect-Engineer organization (in view of the shortage of personnel in the new District organization.) [4]

In addition, the Chief of Engineers believed that the Alaskan situation required another war-time arrangement --the Cost-Plus-Fixed-Fee (CPFF) contract. In normal times and in the case of most civil works, the Corps opens projects to competitive bidding, a process that requires the contractor to submit a lump-sum estimate for the project. Under the pressures of war or the exigencies presented by the Alaskan situation in the early post-war period, the Corps employs a CPFF system in which the government employs a contractor, reimburses him for costs incurred in the performance of his contract, and then provides him with a fixed fee over and above those costs. The chief merit of the latter system lies in the smaller number of personnel required in the Corps' organization.

However, the CPFF method is usually more costly and more susceptible to abuse. But it does secure contractors where large amounts of work are required to be finished in an extremely small amount of time or where operating conditions are so difficult as to discourage contractors from competitive bidding. [5]

To handle the Alaskan construction in its earliest phases, the North Pacific Division ultimately chose a contractors' combine consisting of S. Birch and Sons Construction Company of Great Falls, Montana; Al Johnson Construction Company of Minneapolis, Minnesota, and E.F. Lytel Company of Sioux City, Iowa. This organization, soon known simply as B-J-L, maintained headquarters in Seattle and field representatives in Alaska. The AE organization selected by the Division was the firm of Fay, Spofford, and Thorndike of Boston, Massachusetts.

In 1946 and 1947 construction centered first of all on building and improving existing facilities for the military population. For example, the FY 1947 building program at Fort Richardson included an office for the District Engineer, NCO family quarters,

fire and crash stations, civilian family quarters, barracks for enlisted men, an officer's mess, civilian mess, utilities, fuel storage, warehousing, and rehabilitation of the hospital constructed during the war. [6]

Other war-time facilities were to be rehabilitated and improved, chief among them the Army docks at Whittier and Anchorage. [7] The major new facilities to be constructed under the direction of the District Engineer were new bases (or the up-grading of old ones) for the strategic air arm. These projects involved creating bases capable of handling the B-36 bomber and associated fighter components. Fort Richardson was to have its runway extended and improved to handle the huge aircraft. The Corps also began to construct an entirely new airfield for B-36 operations at Mile 26 near Fairbanks. This field, first known as "Ladd Extension," ultimately became Eielson AFB. Still a third site was explored for the B-36--the region around Clear. [8]

The Mile 26 project was the most formidable of the lot for it involved the construction of a small city in addition to runways and hangars. The site required barracks for 1,000 men, basic utilities, roads and streets, fuel storage, a 60,000 square foot hangar, and a 10,000 foot runway for the B-36. In addition, it was necessary to build a spur line from Fairbanks in order to connect the new base with the Alaska Railroad. [9]

This ambitious early program ran into considerable difficulties. There was, for example a labor shortage in the continental United States. Even when adequate numbers of workmen could be found and shipped to Alaska by the construction combine, there were considerable difficulties with housing. To supplement civilian labor, elements of the 925th Engineer Aviation Group were assigned to Alaska in December 1946. These troops were placed under the operational control of the Alaska District Engineer with the prerogative of actual mission assignment reserved to the Department Commander. [10]

The early phase of construction also encountered a major shipping strike in 1947, a problem which had a severe impact on the District's mission. For example, by October of that year, supplies of cement in Alaska were virtually exhausted. The strike shifted the burden of transportation to the Alaska Highway and to air transport. This greatly stimulated a rash of unscheduled airline operations bringing in everything from food to building supplies.

The construction program had barely begun when it ran into budgetary problems. On 31 July 1947, the War Department informed the Alaskan Department that Congress had adjourned without appropriating any new money for construction in the next fiscal year. This naturally led to the curtailment of some projects in favor of those having a higher priority. For example, the projected B-36 base at Clear was abandoned while projects at Ladd, Richardson, and Mile 26

were maintained.[11] In October 1947, the Chief of Engineers urged the closest attention to "economy and sound administration" and further indicated that future construction should be handled by lump-sum methods. Despite these difficulties, substantial construction had been set on foot by early 1948. In February of that year, the District reported that $72.9 million had been committed to active projects under the FY 1947 program.[12]

By the middle of March 1948, the conversion to lump-sum contracting prompted by economy considerations had become firm policy.[13] This development made the work of the Alaska District more difficult. A large construction program was underway, many projects were incomplete and had to be finished under a new contracting system, and the District was short of personnel required to administer the lump-sum system.

By June 1948, the hard decisions had been made about the Alaskan construction program. Much work had to be halted and deferred owing to diminished funds. The Chief of Engineers allowed $17.4 million worth of work at Ladd Field but deferred another $18.9 million at the same site; he permitted design and planning at Mile 26 and Fort Richardson, but deferred additional construction at those sites. At Whittier, a project of reasonably high priority, construction on a warehouse and the accumulation of materials for other work were allowed but everything else was temporarily deferred.[14]

The Chief of Engineers further directed that projects started with FY 1946 funds "must be considered complete." This stopped projects worth $15 million at Eielson (Mile 26), $9.2 million at Ladd, and $13.7 million at Fort Richardson. These cutbacks resulted in a period known to District Employees as the "year of the skeleton monuments." Barracks, warehouses, messhalls, and other structures were left standing with open steel beams, abandoned by workmen. Buildings that had been enclosed often just approached "bearable occupancy and use." Some structures had no interior trim and no insulation on water pipes. Some warehouses had but one coat of exterior paint, and no plumbing, heating, or fire protection.[15]

While financial difficulties were slowing the construction effort, the District was moving from CPFF contracting to the lump-sum system. In order to secure sufficient interest among contractors to make the system work, the District had to make special efforts to publicize impending military projects (a somewhat difficult task in view of the slowdown in Alaskan construction). Considerable advertising had to be done "Outside" as there were very few competitive Alaskan contractors. This was done in several ways--the usual ads in the trade journals, a special pamphlet entitled "Prospectus of Construction to be accomplished in 1949," and a speaking tour by the District Engineer. The District also provided considerable material incentives for contractors. In March of 1948, the Chief of

Engineers directed the District to provide warehousing for contractors and to assist them with local transportation problems. But perhaps the most important attraction was the availability of fairly large amounts of construction stocks, heavy equipment, and spare parts. [16]

The widespread advertising, the speaking tour, and the provision of government material allowed the transition in contracting systems to be made with a minimum of difficulty. It also attracted a wider range of contractors, including some growing Alaskan firms for the first time. [17] And of course, as the lump-sum system and added projects required increased personnel, the size of the District's staff grew considerably. The organization had grown tremendously from the period when Colonel Lang had difficulty in finding an office for himself.

THE KOREAN WAR AND THE CONSTRUCTION PROGRAM OF THE 1950'S

The outbreak of war in Korea led directly to American intervention under the auspices of the United Nations, an action that required the commitment of American ground combat forces. The general mobilization in support of the war suddenly produced a tremendous expansion of work for the Alaska District; it also freed up the money to accomplish the work. Expenditures in FY 1949 amounted to just over $40 million; in FY 1952 the total nearly quadrupled to approximately $160 million. Over the period from 1949 to 1960, the District administered over a billion dollars worth of contracts, truly an extraordinary responsibility and achievement (see Appendix F). Of that total sum, some $98 million was spent on family housing alone, a figure that suggests just how much inadequate housing had been a constraint on the expansion of the military presence in Alaska in the past. [18]

Initial construction during the period of the Korean emergency more or less centered on completion of the support facilities for a substantial permanent military establishment in the Territory, one of the primary aims of the immediate post-war program. The following table shows projects undertaken between 1949 and 1960 at Fort Richardson, Elmendorf AFB (the old Fort Richardson), Ladd AFB, and Eielson AFB. Each of these cost $1 million or more. The table illustrates the nature and scope of this portion of the District's military construction program:

CONSTRUCTION ITEMS	COST IN MILLIONS
A. Fort Richardson	
Outside utilities	$ 3.36
Two warehouses	3.60
Ship Creek Dam and water intake	1.00
Central heat and power plant	11.23
Ordnance vehicle repair shop	1.44
Indoor training facility	1.98
Refrigerated warehouse	2.39
General depot; engineer shops	2.90

CONSTRUCTION ITEMS	COST IN MILLIONS
A. Fort Richardson (cont'd.)	
Organizational shop buildings	2.59
Outside utilities; railroad trackage and railroad yards	8.15
Laundry and dry cleaning plant	1.54
Paving roads and streets	1.09
Composite administration building	2.02
Ammunition storage, pads, access roads	1.23
Outside utilities, road and street paving, storm drainage	2.97
General depot warehouse and outside utilities	1.50
Hardstands and parking aprons	1.72
General warehouse, outside utilities	1.45
Community center building and QM sales store	1.22
B. Ladd AFB	
Hospital	7.38
Water treatment storage and sewer treatment facility	1.95
Outside utilities	9.51
Powerplant extension	13.45
Automotive maintenance facility	1.48
Organizational maintenance buildings and gas stations	1.06
Laundry and dry cleaning plant	1.53
Heat and power plant addition	1.80
Aircraft fueling system	2.45
Paving roads, streets, and sidewalks	3.82
Ammunition storage	1.08
Theatre, flight simulator, PX, maintenance shop, armament, and electronics shops	1.50
5716 feet of utilidors	1.50
Aircraft access aprons	1.30
Aircraft apron paving	1.77
Ammunition storage facilities	2.31
C. Eielson AFB	
Central heat and power plant	9.79
Hangar	4.19
Outside utilities	6.69
Water treatment storage and sewerage treatment facilities	2.09
Outside utilities	3.93
Bulk petroleum storage and handling facilities	3.06
Fieldhouse	2.02
Aircraft parking apron	3.45
Remote transmitter	1.10
Extension to central heat and power; utilities	2.88
Hardstands, taxiways, hydrant fueling system	5.71
Roads and streets	3.03
Ammunition storage	1.11
Multi-purpose maintenance docks	1.37
Utilidor rehabilitation	1.31
Ordnance storage	3.73
D. Elmendorf AFB	
Streets, curbs, sidewalks and drainage	1.02
Station warehouses	2.20
Outside utilities	2.58
Automotive maintenance facility	2.13
Paving roads and streets	1.09
Hospital	8.95
West heat and power plant	11.96

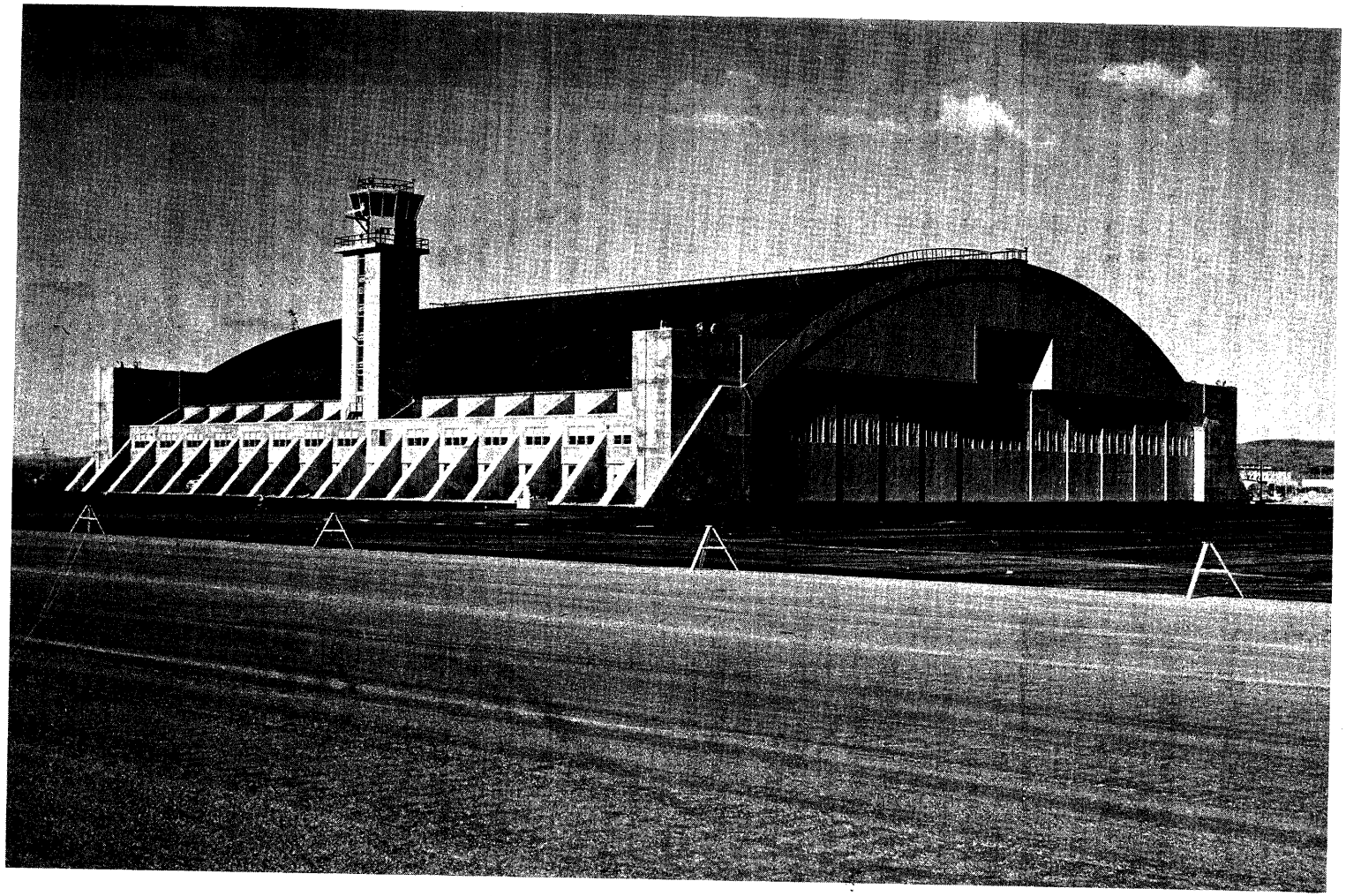
CONSTRUCTION ITEMS	COST IN MILLIONS
D. Elmendorf AFB (cont'd.)	
Warehouses; ramp facilities . .	1.63
Outside utilities	1.45
Aviation fuel storage, taxiways, hardstands and hydrant refueling systems	9.34
Storm drainage, outside utilities, roads, streets, and sidewalk paving	3.46
Depot warehouse and outside utilities	2.43
Paving and taxiway lights, clearing and grading	1.88
Nose-wing hangars	3.74
Water supply mains and utilities for hardstand area	1.11
Runway extensions, hardstands, fillstands, tanker unloading, hydrant system, fuel lines	11.10
Taxiway and runway access stabilization	1.31

Military construction soon moved into a wide variety of other important areas, chiefly the development of air defense systems for Alaska and the United States. In the period following the end of the second World War, the threat of a surprise aerial attack led to plans for the development of an integrated and coordinated warning system. During the war, such warning systems had consisted mainly of limited range radar and spotter networks. Owing to the relatively limited range and capabilities of enemy aircraft, warning systems were used primarily to protect specific military installations. As relations with the Soviet Union worsened and that power developed both long range aircraft and the atomic bomb, national defense policy turned from the exclusive protection of specific establishments to the defense of American air space in general. In this last development, the northern polar air routes and the Alaskan routes in particular became extremely important.[19]

Initial planning for Aircraft Control and Warning (AC&W) systems for Alaska envisioned two lines of radar scanning stations. The first or outer line would run along the coast; the second would be based in the interior. Much of the work to be done in constructing these systems was to be done under the supervision of the Alaska District.

There were several important considerations to be met in the selection of sites for the warning stations. They had to be located in strategically significant areas with favorable conditions for building foundations. As the radar devices had relatively short ranges, they had to be placed on high elevations. The sites initially chosen for the outer ring were at Northeast Cape on St. Lawrence Island, Cape Lisburne, Cape Romanzov, and Tin City, all on the coast of the mainland. Another site, at Cape Newenham, was added very shortly after the choice of the initial group. The contracts for these facilities were awarded in 1950 and 1951.

At Lisburne, Romanzov, and Tin City, significant difficulties arose for the contractor and his work force. At the outset, the bare sites presented a

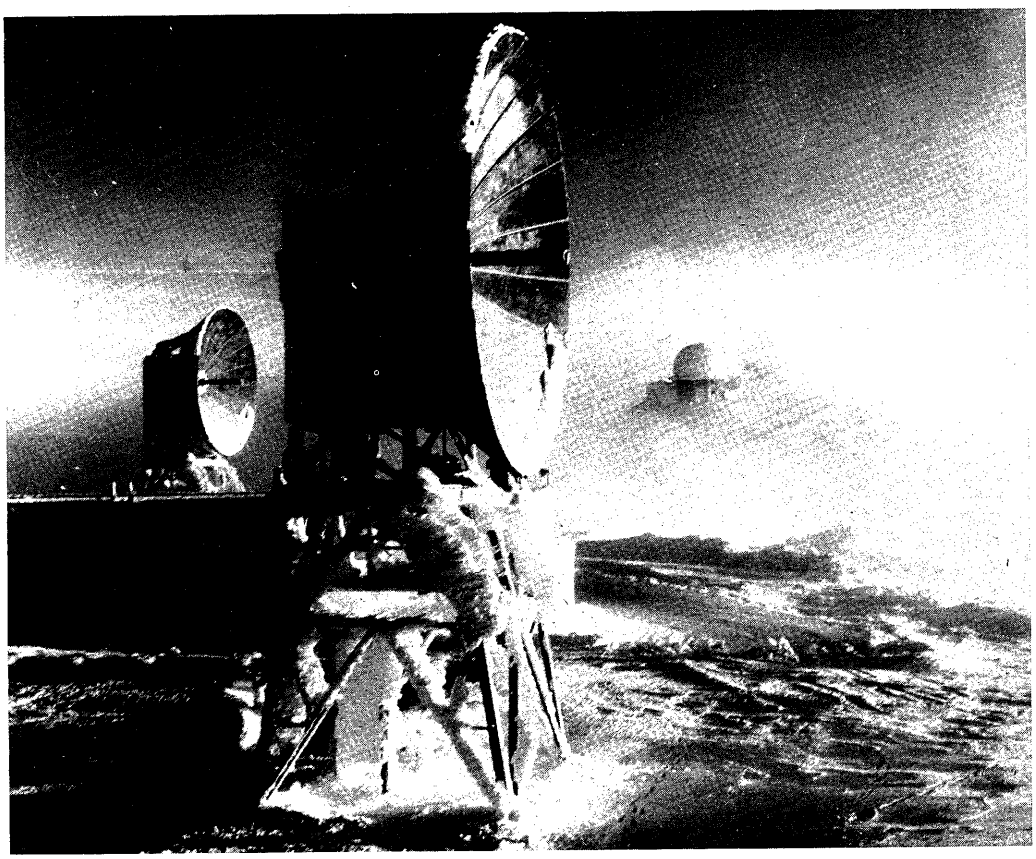


Largest hangar in Alaska, Eielson AF Base.

District Office (foreground) and family housing, Elmendorf AFB, 1965. Housing at left of street built in early 1950's.

problem in getting necessary supplies and equipment from ships or barges to the hilltops chosen for the radar instruments. Most of the sites had no real harbor facilities and everything had to be lightered ashore across shallow waters. Still a worse problem was getting material from shore to the high ground, and here, the weather often intervened. Roads built in good weather turned out to be useless when bad weather arrived. Drifts of deep snow, glaze ice, and rain often made them impassable. Something had to be done to ease the situation. After considering several alternatives, it was decided that aerial tramways were the best solution. These consisted of tramcars running on cables suspended from towers.

This system encountered problems of its own. The tramcars were supposed to be operable in winds up to sixty miles per hour but many of the saddles on which the tramcars rode the cables were defective. As a consequence, at Cape Newenham, one of the trams fell to the ground, fortunately without killing anyone.



AC&W equipment at Tatalina AF Station.

In addition, at some sites, the towers were made to carry communications lines as well as tram cables. Ice accumulation on the cables broke the supporting arms and the cables fell to the ground. [20]

stations presented a new set of difficulties. Most of these sites had to be reached and supplied by air. This problem made it very difficult and expensive to construct the required facilities. Ultimately, the inner ring was

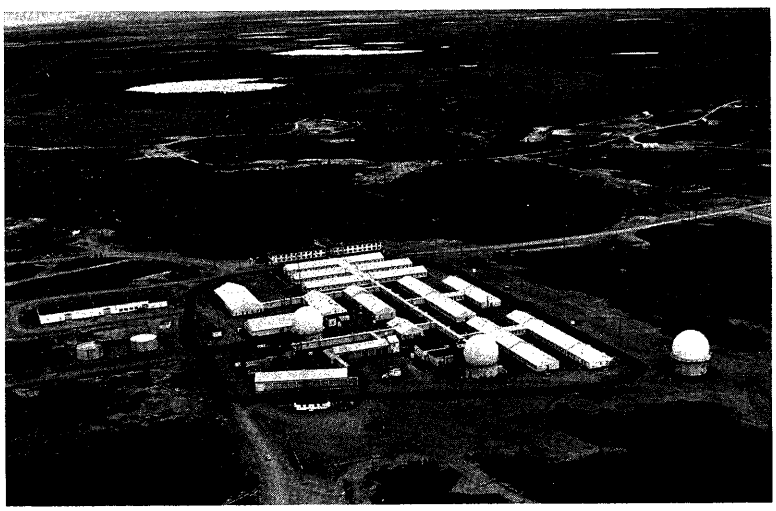
Tramway between lower and upper camps at the AC&W site at Tin City AF Station.

When the outer ring was virtually completed, the inner rings of stations were begun, with sites at such places as Bethel, Campion, Chiniak, Fort Yukon, Galena, King Salmon, Indian Mountain, Kotzebue, Sparrevohn, Tatalina, and Unalakleet. Where the outer ring had problems with access roads and lack of harbors, the inner supplemented by a group of reserve sites at Middleton Island, Ohlson Mountain, Chiniak, Sitkinak, Fire Island near Anchorage, and Murphy Dome near Fairbanks.

A brief inventory of the construction at Newenham illustrates the scope of the work necessary for the con-

struction of a warning station. The contractors had to build barracks, administration and dispensary facilities, an operations building, a recreation building, transmitter and receiver facilities, a tramway, an antenna system, storage for ammunition, an airstrip, and all the necessary supporting utilities. [21]

to the Aleutian Chain. The Alaska District supervised this portion of the program, particularly the construction of six stations in the Chain: Cold Bay, Cape Sarichef, Port Heiden, Port Moller, Driftwood Bay, and Nikolski. These stations were built between February 1957 and October 1958 at a total cost of about $25 million. [22]



"Flat land" AC&W site near King Salmon Airport, 250 miles southwest of Anchorage.

Taken together, between 1950 and 1960, the Alaska District supervised AC&W construction worth about $82.5 million. This work, however, was but the first installment in the development of an integrated warning system in Alaska. Scientists at the Lincoln Institute (MIT) designed the Distant Early Warning (or DEW Line) system to stretch over 3,600 miles from Cape Lisburne in northwestern Alaska to the eastern coast of Greenland.

The Air Force directly administered the first phase of construction on this project. However, as that construction was drawing to a conclusion, it was decided to extend the DEW Line

The contractors working at Cape Sarichef experienced some conditions that were exceptionally difficult, even for the Aleutians. The Cape is located on the western tip of Unimak Island and the radar site had to be built on the top of a red volcanic hill. When the contractor began the process of slicing the top from the cinder hill, he ran into a solidified lava core and had to blast his way down. The dust and sand created by this operation was blown about with great force by the high winds, resulting in one of the most difficult working environments imaginable.

By the late 1950's, the development of the intercontinental ballistic missile

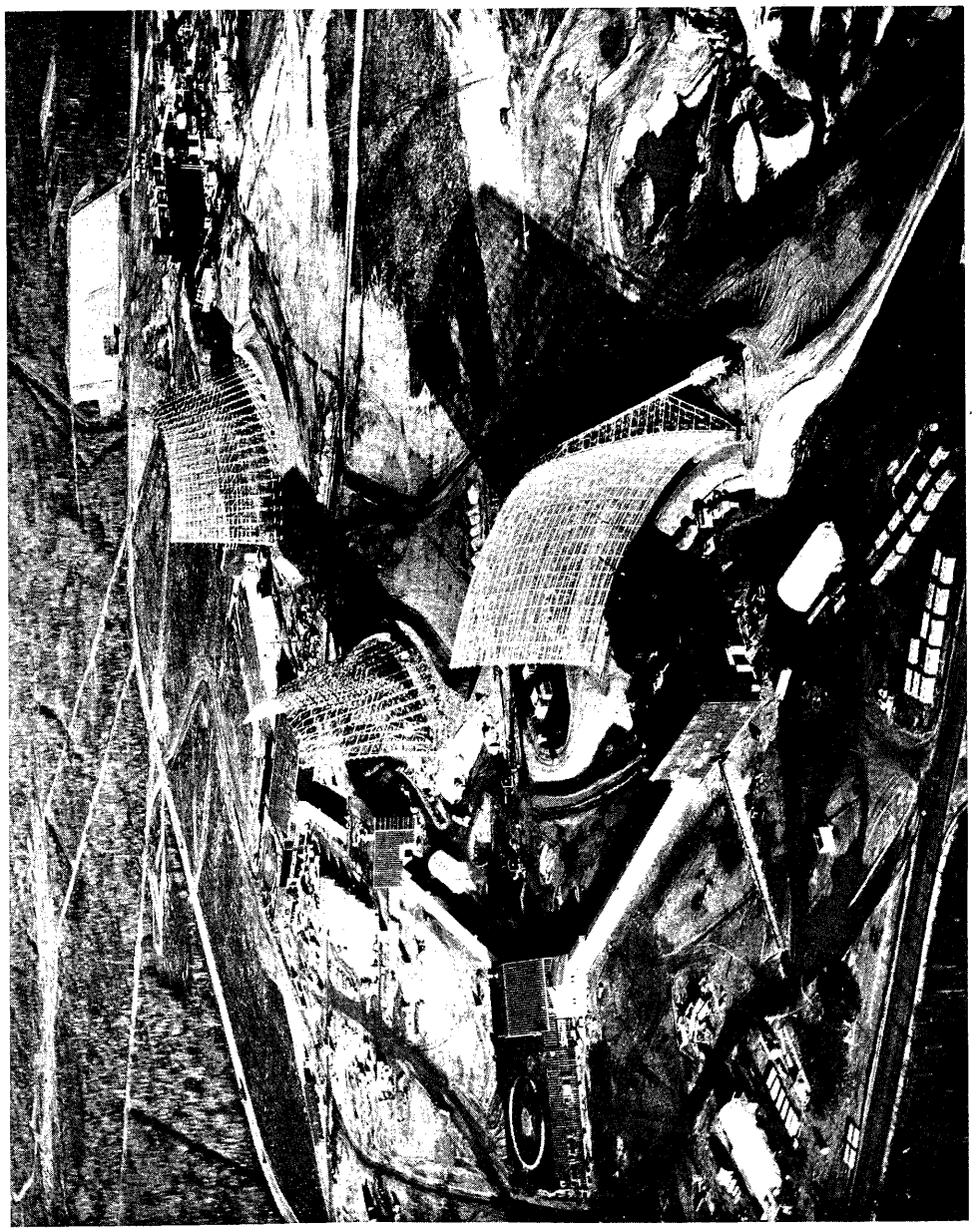
armed with a nuclear warhead made the earlier warning systems inadequate. Those systems could detect the strategic bomber; they could not provide adequate warning of the ballistic missile carrying a nuclear warhead. In the early fifties, the Air Force had experimented with a ballistic missile warning system but, owing to a very high estimated cost, had set the experiment aside. As a consequence of successful ballistic missile launchings by the Soviets in addition to their spectacular achievement with the Sputniks, the Air Force revived the project and placed it in the hands of RCA for further development. Speculation about this very classified project was rife in Alaska from the first moment it became clear a new large defense installation was intended for Alaska. There was considerable speculation not only about the site or sites but the actual function of the installation as well. Some news stories anticipated with excitement the development of IRBM (Intermediate Range Ballistic Missile) sites in Alaska. [23]

In fact, the Alaska District was involved at that time in a study for the development of missile launch sites. [24] The project that ultimately emerged, however, had nothing to do with launching sites; it was instead a BMEWS (Ballistic Missile Early Warning System) site which was to be located at Clear, a location originally intended as a B-36 field in the years immediately following the end of World War II.

At the outset, the Alaska District let contracts for the construction camp in August 1958, which involved the building of some thirteen dormitories, messhalls, warehouses, generator facilities, petroleum storage, access roads, and utilities. In addition, a special spur line was built from the Alaska Railroad to the construction area. A year later, the main contracts were let, most of which were completed by the end of the 1960 construction season.

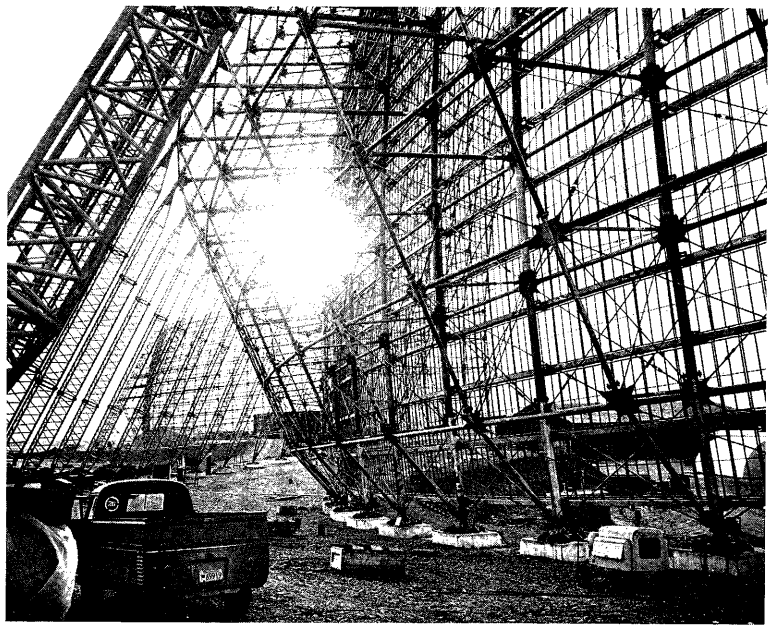
Apart from the sophisticated electronic facilities, perhaps the most notable feature of the project was the construction of the site's power generation and heating facilities, a task that alone cost just over $9 million. In the period just before the installation of the coal-fired generators, the Alaska District imported a power train consisting of a generator railway car that weighed 135 tons. Together with a 100 ton transformer car, it constituted a power plant which could produce 5,000 KW of power. [25]

The RCA company handled the installation and maintenance of the missile warning system under the supervision of the Air Force. When the project was completed, it included three huge detection antennas capable of "seeing" an object 3000 miles into space. Each of these resembled a football field turned on its side. The Alaska District's share in the development of this important project can be measured by the fact that it supervised over $60 million worth of construction in support of the installation of these mammoth sophisticated facilities. [26]



BMEWS site at Clear AF Station, central Alaska, 1960.

At the same time as the BMEWS system was under construction, the Air Force pushed the development of a second system known by the acronym of MIDAS (Missile Identification Detection and Alarm System). The site chosen for this installation was Donnelly Flats, originally a location for one of the old Army Signal Corps telegraph stations. In June 1959, the Alaska District awarded a contract for the construction of a contractor's camp. A month later, construction started on the tracking and data acquisition station. The contractors finished the essential portion of the project by October 1960 but shortly after its completion, the station went into caretaker status. Ultimately the government declared the property to be "excess" and removed much of the equipment for use elsewhere.



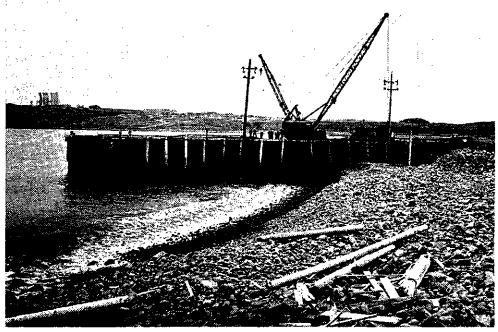
BMEWS radar screen at Clear AF Station.

The Alaska District participated in one other project in the area of warning systems and radar and communications surveillance. The Island of Shemya lies in the Aleutian Chain about 1,300 miles west of Anchorage. It is quite small, measuring only 4.5 miles long and 1.75 miles wide but during World War II it became the largest Army Air Force base in the North Pacific. By 1945, it boasted three runways, one of them 10,000 feet long for use by heavy bombers.

By 1951, the Air Force had effectively abandoned Shemya. But six years later, interest revived again. In 1957, the Air Force began to convert the island into what was termed an "experimental radar station." The Air Force mission on Shemya and the description of some of the equipment used there is, of course, classified information.

Beginning in 1958, the District undertook the general rehabilitation of

the site, a process which has gone on regularly since that time. The District initially supervised the rehabilitation of construction camps and dormitories, recreation and dispensary buildings, messhalls, labs, shops, hangars, and warehouses. The Corps contractor put in a new power system, worked on the dock, and its approaches, moved hangars from Elmendorf to Shemya, overhauled the water and heating systems, and performed a multitude of other chores. Over the decade of the sixties, the District spent about $23 million on new construction and the repair of existing facilities boosting the all time investment on the island to more than $113 million.[27]



Shemya Island dock.

THE DEVELOPMENT OF ALASKAN COMMUNICATIONS

The successful operation of integrated warning systems whether for aircraft or missiles or both requires a sophisticated and reliable electronic communications network. In view of the vast distances involved between installations in Alaska, wire or cable communication was out of the question. It was both insecure and prohibitively costly to maintain. Hence radio communication was the only practical alternative. But it too was constrained by distance and the unreliable atmospheric conditions that often prevail in the north. Direct line point to point beaming over great distances simply requires a very large number of stations.

The Air Force, in cooperation with the Bell Telephone Company, developed a system to overcome these difficulties, a system ultimately known as "White Alice." As in the case of the early warning system, construction responsibilities were split between the Air Force and the Alaska District. Initial construction began in 1954 and the full system came into operation in 1958. The first 22 stations were built under the direction of the Air Force; the next 11 were constructed under contracts administered by the Alaska District.[28]

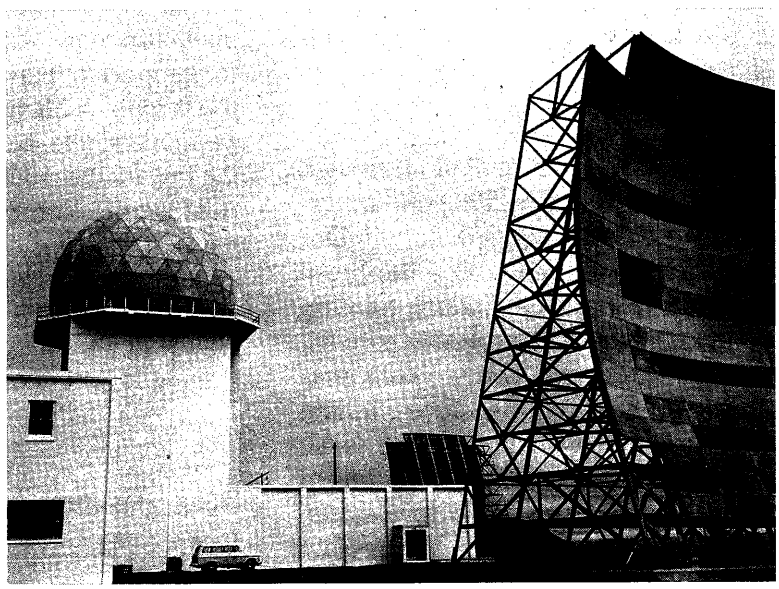
At each station there was constructed an antenna measuring as much as 60 by 120 feet, and weighing 100 tons or more. This completed system works by transmitting radio beams, each of which may contain scores of messages, from one antenna to another. The beam is projected outward from an antenna, deflects off the troposphere, and is captured by a scoop antenna. It is then amplified and sent through the same process again. The whole process is known by the technical description "forward propagation tropospheric scatter," a

system in which the signals are relatively free from jamming and atmospheric disturbance.

Of all the sites constructed under the program, Sparrevohn provided the most challenges. It is located about 165 miles west of Anchorage and cannot be reached by land or water. All supplies for construction had to be flown in with landings made on an airstrip with an upward slope of 12 percent. The Air Force parachuted the initial gear into the site in 1951 and cleared the pioneer airstrip. They then built a base camp and hacked a road to the summit. Thereafter the Alaska District took over, contracting for completion of the AC&W site to be located there, and the completion of the White Alice installation.

The base camp was located 1,500 feet below the site of the AC&W station and the White Alice antenna. The connecting road on the mountain had switchbacks so severe that truck drivers often were required to back and turn twice. During winter, the road often became impassable after a snowstorm and in order to ensure the regular flow of supplies, the aerial tramway system had to be employed.

By the time White Alice was completed in 1958, the cost totalled approximately $140 million and the project had involved the efforts of about 3,500 workers. Of this total, the contracts administered directly by the Alaska District amounted to a little more than $15 million.[29] The new system not only served the military by providing the vital communications links for its comprehensive warning system; it provided a reliable high capacity service to a wide variety of other government and civilian users as well.



AC&W and DEW line equipment at Cold Bay AF Station.

If White Alice provided the essential intrastate communications system without which the warning systems could not adequately function, a further problem remained--the relaying of messages from the DEW Line and the BMEWS system south to the headquarters of NORAD (North American Air Defense Command) and the Pentagon. The message-relaying system adopted by the Defense Department and constructed by the Alaska District became known as "Rearward Communications."

The Alaska District first examined sites for this project in 1959 and advertised for the initial contracts in December of that year. The program called for microwave stations running along an inland route roughly paralleling the Alaska Highway. There was also to be an alternate route running by microwave and White Alice facilities south to Annette Island and from there by submarine cable to Seattle. Between 1959 and 1961, the project involved the construction of 32 stations for which the Alaska District awarded some 28 contracts totalling just over $18 million.

The most costly of these sites was that located on Duncan Canal near Petersburg. There the site was placed on the shoulder of a mountain inaccessible to everything except helicopters. Supplies had to be barged to a beachhead and a road carved up to the site. To illustrate the difficulties involved, the access road alone cost $1.3 million.[30]

In addition to its work on the communications supporting the early warning systems, the Corps planned and directed construction for two other separate communications organizations--AACS (Airways and Air Communication Service) and ACS (Alaska Communications System.) The Alaska District planned and supervised the construction of the basic AACS facilities at Elmendorf, Eielson, and Ladd from 1950 to 1955. The primary function of these facilities was to support military air navigation in the region. ACS was a much older organization, the descendant of WAMCATS. In the 1950's the Alaska District monitored contracts for such ACS and telephone repeater buildings. By far the largest operation undertaken for ACS was the construction of its Fairbanks facility for a total cost of $1,113,500.[31]

PIPELINE CONSTRUCTION

At the conclusion of the second World War, the CANOL System (see Chapter I) lines were shut down. In July 1946, the Corps of Engineers took over control of the system and assigned immediate custody to the Great Lakes Engineer District. In November of that year, the newly formed Alaska District assumed responsibility for what remained of the inactive project.[32]

If CANOL remained inactive, discussion of its wartime function--the cheap transport of high volumes of petroleum--did not. By 1952, the decision had been made to construct a

new pipeline system with much larger capacity capable of transporting a variety of petroleum products. As it ultimately emerged in 1953, the project called for the construction of just over 600 miles of 8 inch pipeline from Haines in the Alaskan Panhandle to the interior. It was to be known as ALCANGO--the Alaska-Canada Gas Oil Pipeline.

From sea level at Haines, the line rose to cross the 3,700 foot high Chilkoot Pass and from there descended to the 450 foot level at Fairbanks in the Alaskan interior.

In addition to the line, terminal docks for tankers, pumping stations, and a huge tank farm were built at Haines. Along the line, storage facili-

Construction of the Haines-Fairbanks military pipeline, 1954.

The route for the line was chosen by USARAL and the Alaska District with the approval of the Canadian government. Under contracts let by the District, construction began at Fairbanks and Haines late in 1953.

ties and other stations were constructed, all linked together by the telephone and teletype networks constructed by the Alaska Communications System. When finished in 1955, ALCANGO was the northernmost ma-

jor pipeline in the world and one of the first truly multi-purpose military lines ever built. As originally designed, it could deliver about 10,000 barrels of product per day.

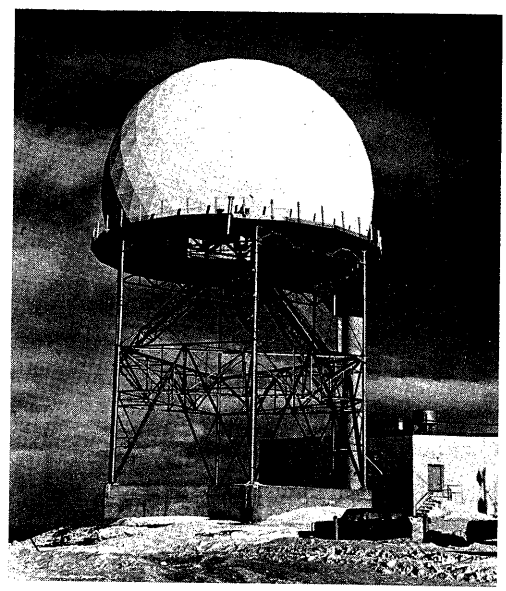
In 1962, the District undertook a crash project to expand the capacity of ALCANGO by adding six more pumping stations. The project, completed in the very short period from April to November 1962, involved not only the installation of the pumping station equipment but also the virtual construction of several small towns as well. Every station had to have family housing and support facilities, as well as storage buildings. The new pumping stations, established over about 500 miles of the line, roughly doubled the system's capacity.

At the pipeline's original dedication in October 1955, Lt. Gen. J.H. Atkinson, the Alaska Commander in Chief, remarked that while the line had cost the American people about $40 million, it was expected to save $3.5 million annually in transportation costs and hence would amortize itself in slightly more than ten years.[33]

THE CONSTRUCTION OF AERIAL DEFENSE FACILITIES

If emphasis was placed on the development of Alaska as an advanced early warning post in the 1950's, considerable effort was also expended to create local defenses for the most important military facilities. These defenses included not only ground troops and tactical aircraft but sophisticated anti-aircraft weapons as well. The establishment of all the facilities necessary to the operation of these forces required a very large effort from the Alaska District. We have already seen how the District contributed to the building of operation bases for aircraft and troops. From the middle of 1955 the District became involved in another area--the development of defensive ground-to-air missile sites. In August 1955, USARAL revealed that installations for Nike Hercules missiles would be built to protect the key military installations at Fairbanks and Anchorage. These were to replace the anti-aircraft gun batteries emplaced around these facilities in the early post-war period. The District surveyed the potential sites, acquired the necessary land, and in March 1957, announced the invitations to bid.

The most spectacular aspect of this project was the construction of a mis-



Radar at Site Summit, 1973.

sile battery site on Site Summit, a 3,900 foot elevation overlooking Anchorage. A great deal of blasting had to be done in order to build the access road and to provide a level site for the radar and missile launch areas. Work was delayed owing to cloud cover in the area in addition to the usual high winds and snow in the winter.

At each site, the District had to make roughly the same provision for support facilities as in the case of the AC&W sites--control buildings, housing, utilities, fuel storage, repair facilities, and sophisticated communication to link these batteries with the fire control centers. In addition, storage facilities were required for the missiles. [34]

THE PORT OF WHITTIER

One of the most controversial military projects undertaken by the Alaska District in the fifties was the development of the Port of Whittier on Prince William Sound. During World War II, fear for the security of the Port of Seward and the rail line running north to Portage led the government to construct an Army port at Whittier and connect it to the Alaska Railroad with a rail cut-off. It will be recalled that the construction work on this project was originally done under the supervision of the Engineers. In any case, at the conclusion of the war, the government closed the port and declared it to be "surplus." [35]

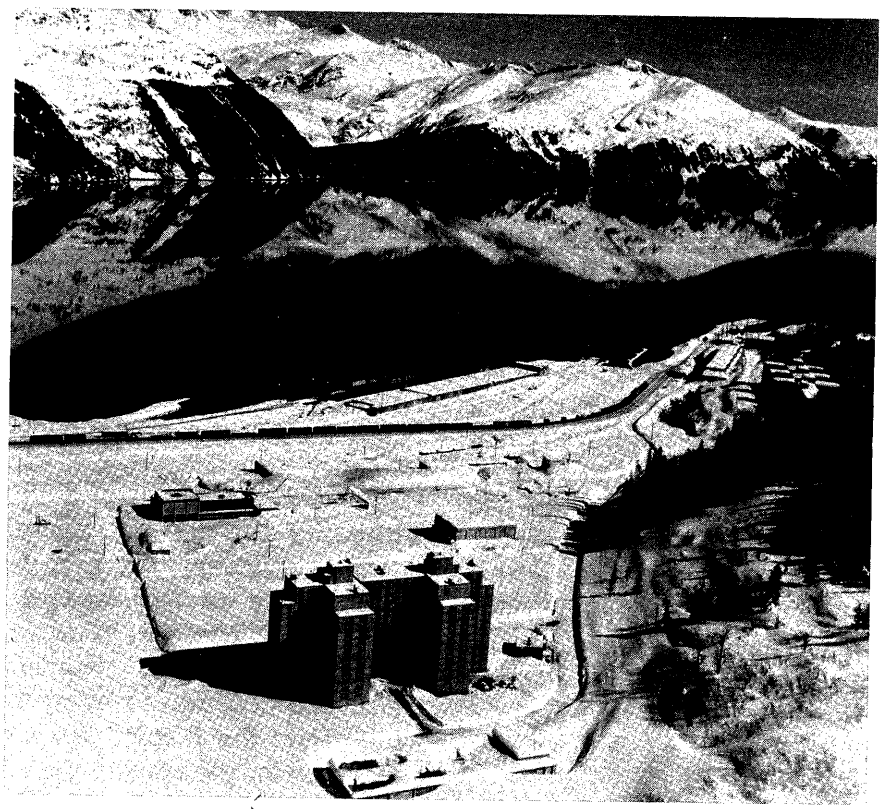
In 1946, the government briefly reopened the port to accommodate troops coming to Alaska for a training exercise. A year later, the Army finally decided to make the port a permanent installation and the Seattle District set about the business of rehabilitating the facility. In 1949, the Alaska District assumed responsibility for construction at the port including the development of petroleum handling facilities at a cost of some $2,140,000.

By far the most spectacular and controversial aspect of the project was the construction of the Buckner Building. This project, which began in April 1951, was to build a composite structure for housing and recreation for the troops stationed there. It was to be a small town under one roof. When completed in 1952, the building stood seven stories tall and provided housing for a maximum number of 1,700 persons, at a cost of some $6.5 million. The building contained snack bars, a library, classrooms, a rifle range, barber shops, a post office, a theatre, a hospital, dining rooms, dormitories, exchanges, a commissary, and a jail. When the structure was turned over to the Army in August 1953, four soldiers were needed to carry the 932 keys to the building. [36]

As the construction of the Buckner Building was drawing to a close in 1953, a disastrous fire destroyed the entire cargo handling facilities at the port. As the port was in heavy use at the time, emergency unloading facilities were constructed using troop labor. Then the District designed and arranged for the construction of temporary steel prefabricated docks. These were built in South Carolina

and Texas, then towed as barges to Whittier, and installed in December of 1953. The District then proceeded to build a new permanent docking and cargo-handling facility which was completed at a cost of $4.3 million in 1957. During the same period, the District administered a $4.2 million dollar contract for the construction of a second large composite structure--the Hodge Building for family quarters which rose to a height of 14 stories. [37]

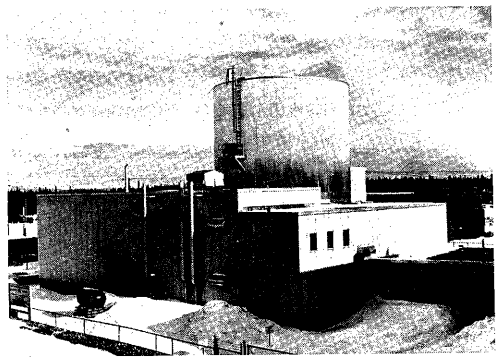
Controversy broke out over the port and its expensive facilities when the Army discontinued its use in September 1960, barely four years after the completion of the Hodge Building and three years after the completion of the new dock and cargo-handling facility. Initially, the Army offered the property for lease with the reservation that it could be used as a military port in the event of a national emergency. As there was no response to the leasing proposal, the Army declared the port to be "surplus" in 1963, an action that provoked serious questions about the wisdom of having invested so much money in what apparently had become a "white elephant." [38] Despite having declared the port to be "surplus," the Army continued to use it to handle petroleum shipments.



Port of Whittier, 1953. Hodge Building in foreground.

THE NUCLEAR POWER PLANT

In December 1955, the Alaska District was directed to conduct a site-selection study to choose a place where a small nuclear power plant could be satisfactorily tested in an Arctic environment. Ultimately Fort Greely, an installation located about 75 miles east of Eielson AFB, was chosen on account of its accessibility and its appropriately severe climate.



SM-IA nuclear power plant.

The announcement of the decision in December 1957 occurred at a time when there was considerable sensitivity to the word "nuclear" among the Alaskan public. This was owing to speculation by Dr. Edward Teller and the AEC on the use of nuclear explosives to create deep water ports on the Seward Peninsula for the purposes of extracting the mineral resources of that area. The nuclear idea was abhorrent to many Alaskans.

Early in 1958, the District let the contract for the construction of the plant in the amount of $4.9 million. Construction was set back somewhat by the lengthy carpenters' strike in 1959, but the plant was turned over to the Army in the spring of 1961. When the fuel for the installation was delivered in 1960, the only real economy of the project became obvious. Within 750 pounds of packaging was contained the U-235 uranium fuel element, itself weighing a mere 50 pounds. Only 14 pounds of the fuel were required to run the plant for one year--the equivalent of 3 million gallons of fuel oil. [39]

SUPPORT OF THE ARMY AND AIR NATIONAL GUARD

Apart from its vital role in building a permanent physical establishment for the regular components of the Army and Air Force, the Alaska District contributed a great deal to the Army and Air National Guard. Facilities for the Air Guard, for example, were built under the District's supervision in the years, 1954-55. These facilities included a hangar, a warehouse, and the supporting utilities systems. Initially the facilities were occupied by the Air Guard's 144th Fighter-Bomber Squadron, but in 1957 the Air Guard unit was changed to the 144th Air Transport Squadron and equipped with C-47 aircraft. This development required the District to design and direct the expansion of the base, a task completed by March 1959.

In the spring of 1959, the District undertook a project in support of the Army Guard--the installation of local armories at 48 different villages in central and coastal Alaska. These armories were 20' by 60' galvanized structures erected on timber foundations.

They were required for the many small units of the 1st and 2nd Eskimo Scout Battalions for training and communications centers. They had the additional merit of being suitable, when not used by the Guard, as community centers and village meeting places.

The buildings themselves were quite simple in design and assembly. The major problem was to transport the structures to their intended sites. In almost every case the contractors received welcome help from local villages in handling installation problems. At Saint Michael, local men and women helped move the materials up a steep slope; elsewhere villagers waded out across tide flats to move supplies to shore. At Little Diomede, an island in the Bering Strait, the villagers used walrus-skin boats to transport the material. Erection of the prefabricated buildings was done by villagers under the supervision of the contractor's foremen. [40]

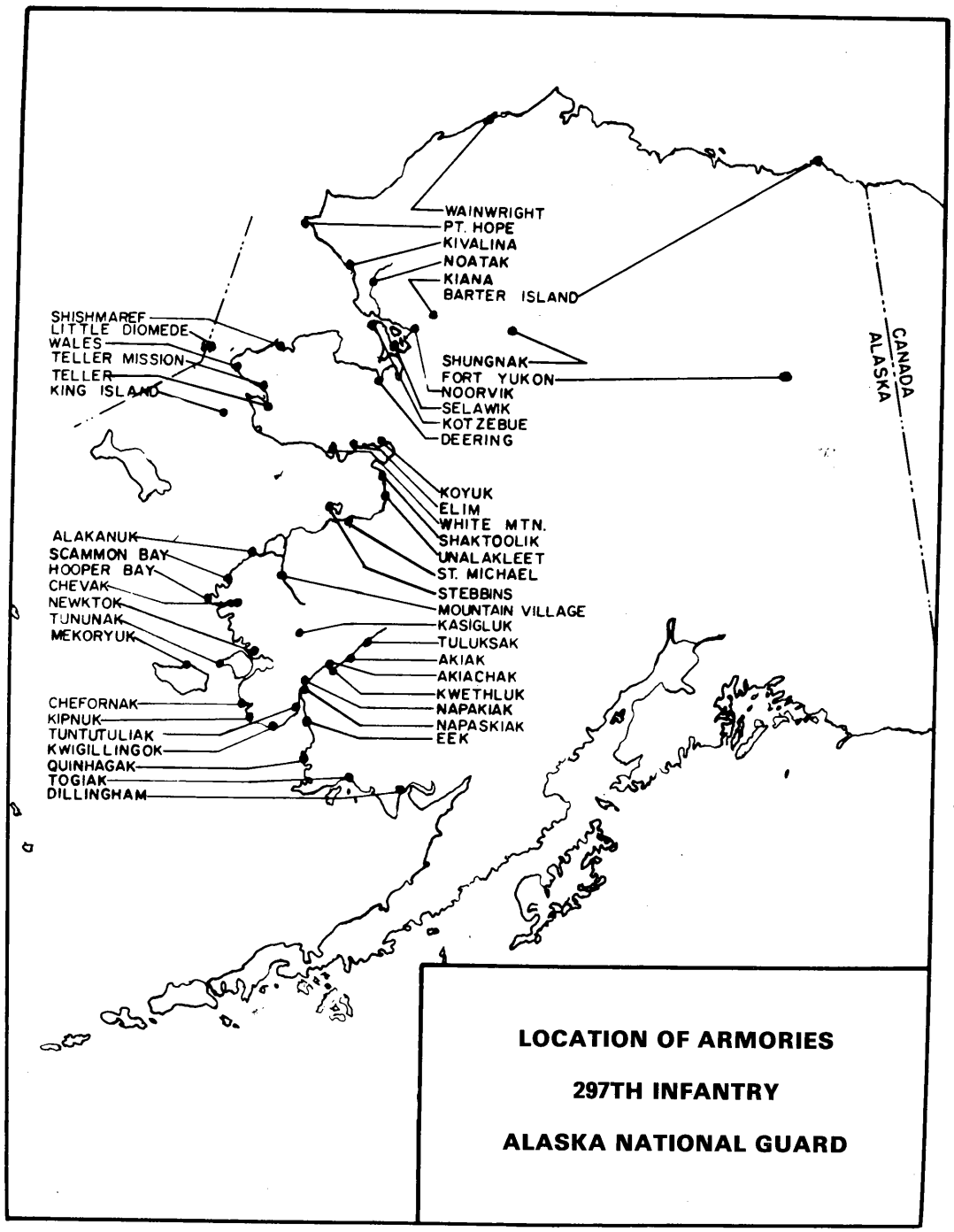
THE SIXTIES: ATOMIC TESTING AND THE VIETNAM WAR

By the end of 1960, the massive program of military construction, first undertaken by the District in the midst of the Korean emergency, was drawing to a close. At the height of its operations, the District had retained over 700 civilian employees; in 1960 and 1961 it began to reduce the work force as the amount of military construction declined. In that period, the District vacated about 130 positions and in October of 1961, it announced the closure of its special Seattle Office which had been an expediting service unit during the extensive military construction program of the fifties.

In February 1961, Col. Christian Hanburger, the District Engineer, spoke to the Anchorage Chamber of Commerce. In his address, he reviewed the past record of the District's military construction and described the work he anticipated would fall to the Engineers in the future. He pointed out that the pioneering work was over, and the fundamental features of a permanent military establishment in the Territory had been developed. Future military construction, in his view, would be undertaken on a much smaller scale. For example, according to the District projections of that period, the value of work to be put under contract in 1961 was $27 million as opposed to the sum of $95 million allotted in FY 1960. [41]

If the District's military construction program assumed a much lower profile in the 1960's, nonetheless several important and sometimes controversial military tasks were taken in hand. Apart from maintenance and improvement of existing facilities, always a large and important task, the District became involved in preparations for underground nuclear testing, the construction of yet another military pipeline to service the program of aerial transport undertaken in support of the war in Vietnam, and the rehabilitation of facilities damaged by the severe earthquake of March 1964.

In the early 1960's the Department of Defense and the Atomic Energy


WAINWRIGHT
PT. HOPE
KIVALINA
NOATAK
KIANA
BARTER ISLAND
SHISHMAREF
LITTLE DIOMEDE
WALES
TELLER MISSION
TELLER
KING ISLAND
SHUNGNAK
FORT YUKON
NOORVIK
SELAWIK
KOTZEBUE
DEERING
CANADA
ALASKA
KOYUK
ELIM
WHITE MTN.
SHAKTOOLIK
UNALAKLEET
ST. MICHAEL
STEBBINS
MOUNTAIN VILLAGE
ALAKANUK
SCAMMON BAY
HOOPER BAY
CHEVAK
NEWKTOK
TUNUNAK
MEKORYUK
KASIGLUK
TULUKSAK
AKIAK
AKIACHAK
KWETHLUK
NAPAKIAK
NAPASKIAK
EEK
CHEFORNAK
KIPNUK
TUNTUTULIAK
KWIGILLINGOK
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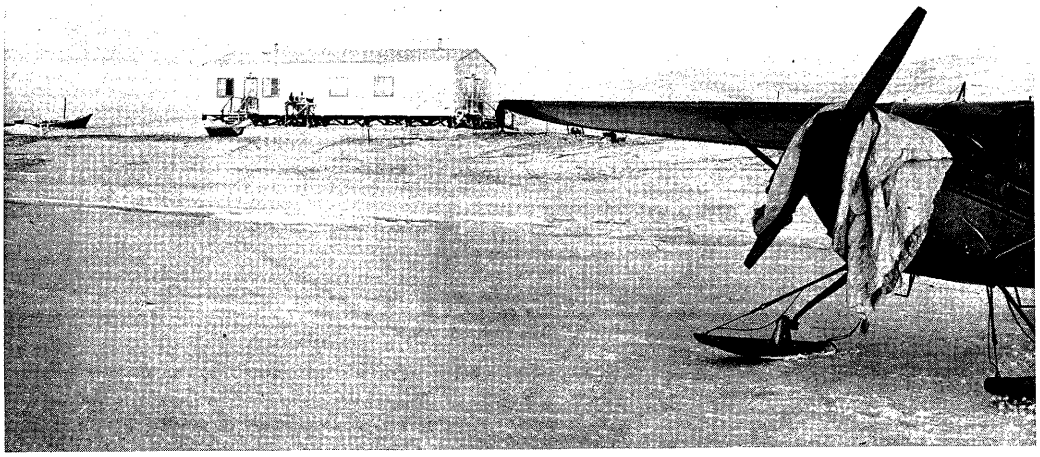
TOGIAK
DILLINGHAM
LOCATION OF ARMORIES
297TH INFANTRY
ALASKA NATIONAL GUARD



Alaska Army National Guard armory at Stebbins, Saint Michael Island.

Commission undertook surveys of possible sites for underground nuclear testing. One of the sites ultimately chosen was Amchitka Island, located in the Aleutian Chain some 1,340 miles from Anchorage. The island had been developed during the World War II campaign in the Aleutians as a forward air base. Amchitka was chosen as the site for a project designated "Long Shot" to be carried out by the Defense Atomic Support Agency under the aegis of the Defense Department. The Atomic Energy Commission was given the responsibility for drilling the test holes and providing the appropriate instrumentation for the experiment which was designed to discover if remote instruments could distinguish between an underground test and an earthquake.

The Alaska District undertook the work of preparing the support facilities at the site. It supervised contracts for the rehabilitation of war-time facilities--primarily the dock and the construction of a contractor's camp for technicians and engineers. The test explosion was set off on 29 October 1965 with results highly satisfactory to the sponsoring agencies and without any major damage to local wildlife.[42]

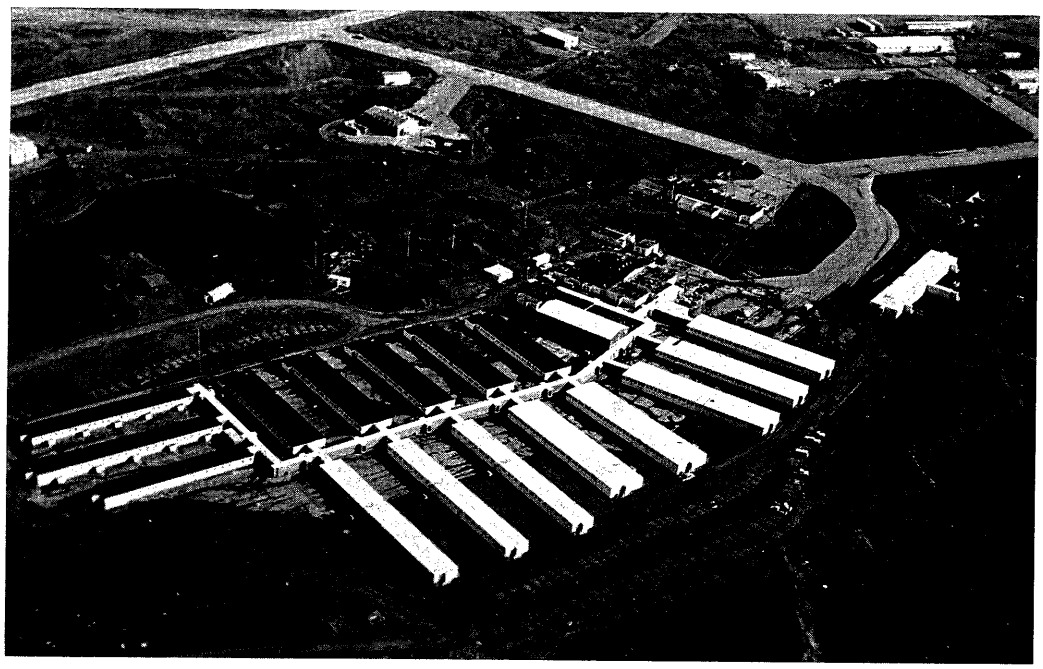
A year later, the AEC announced that it was considering other remote Alaskan sites with a view to further underground testing. In this process the AEC solicited from the District the general criteria for suitability of test sites which in this instance were to be used to test nuclear weapons. At first AEC indicated an interest in an area in the Brooks range as a possible test location, but this proposal was firmly opposed by local groups, primarily the local Native associations and the Alaska Federation of Natives.[43]

As a result of these difficulties, the AEC again turned its attention to Amchitka. As in the case of the first test, the Alaska District handled the preparation of the support facilities for the project, including the building of a

new road and construction camp. Under AEC contract, eight holes were drilled, two of them to a depth of 6,200 feet. The test, according to AEC, was a "calibration event" designed to provide information on the feasibility of a still larger explosion at the Amchitka site. On 2 October 1969, this test, designated "Milrow" was carried out and registered an underground shock of 6.5 on the Richter Scale.

ment. And, as in previous tests, the Alaska District assumed the responsibility for further improvements and maintenance of the test facilities.

The AEC encountered heavy opposition to this test from federal, state, and Canadian legislators. Citizen groups ranging from those concerned over ecological damage to those against the Vietnam war expressed vigorous opposition. Protests were filed



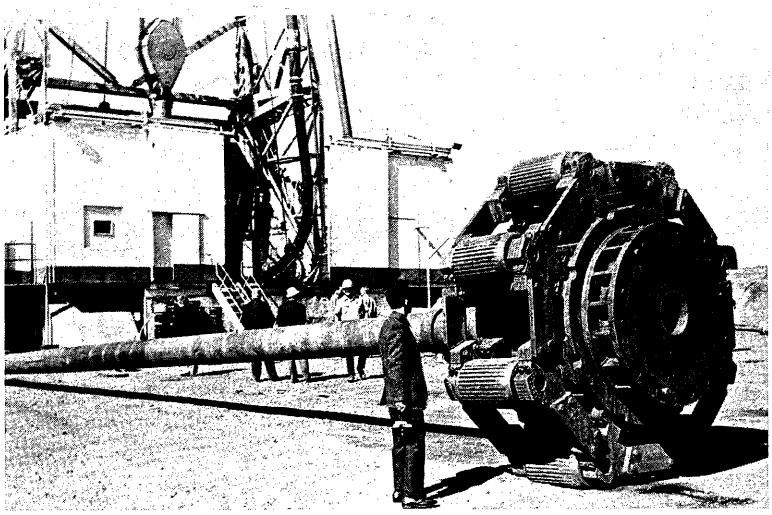
Base camp, Amchitka Island, September 1969.

Within a few months of the Milrow test, the AEC announced its plans to detonate another device on Amchitka in late 1971. This test was to be larger than Milrow and the device was to be exploded at the bottom of a 6,100 foot hole. Again, as in the case of Milrow, the AEC intended the test to serve the program of nuclear weapons develop-

by several native organizations and a U.S. Senator from Alaska picketed the White House.

On 6 November 1971, in the presence of AEC Chairman James Schlesinger and his family, the test (called "Cannikin") was carried out. It resulted in a shock which registered 7.0

on the Richter Scale. It produced some local damage to wildlife, and caused rock falls and slides along the coast of the island, but it did not produce the earthquake or tidal wave feared by many.[44]



Amchitka, 120-inch drill.

THE WHITTIER-ANCHORAGE PIPELINE

As the American effort in Vietnam expanded, beginning roughly in the year 1964, Alaskan military installations (especially those located at Elmendorf AFB near Anchorage) became more important. Anchorage had come to serve as an important refueling point for civilian and military aircraft on their way to the Far East from the United States. Late in 1965, Lt. Gen. Raymond Reeves, the Commander in Chief, Alaska, announced the beginning of C-141 Starlifter cargo operations through Anchorage in support of the war in Southeast Asia. General Reeves estimated that the operation would require 432,000 gallons of fuel daily by 1967.

In January 1966, General Reeves announced his support for the construction of a pipeline to run from the Army's port at Whittier to Anchorage. This announcement triggered considerable controversy involving the City of Anchorage and the Alaska Railroad, both of which were concerned about the loss of revenue through the use of a military pipeline.[45]

Ultimately, in March 1966, Congress passed an emergency authorization bill for the construction of the pipeline and the Alaska District began work on the project shortly thereafter. The District invited bids on a line that was to extend over approximately 61 miles and which was to be buried for about two-thirds of its length. Initially the District had planned to run the line through the railway tunnels connecting Whittier with the main line of the Alaska Railroad. Railroad officials believed this to be too hazardous an arrangement; they received support for their position from the Interstate Com-

merce Commission. This development forced the District to design an alternative which turned out to be a second small tunnel drilled parallel to the railroad tunnel.

When the pipeline was finished in 1967, it represented another substantial engineering achievement as it began at sea level in Whittier, passed through one mountain, and then rose to cross a 3,600 foot mountain pass before descending toward Anchorage. The line was an important, indeed vital, contribution toward the maintenance of the aerial supply operations in support of the Vietnam War.[46]

REAL ESTATE MANAGEMENT: THE ACS SALE

One of the unspectacular but nonetheless very important responsibilities vested in the District is the management of military real estate. The largest and most difficult task in this area was the sale of ACS (Alaska Communications System) to the Radio Corporation of America. It will be recalled that ACS was the descendant of WAMCATS, the communications system first developed by the Army Signal Corps in the first decade of this century. That organization ran ACS up to 1962 when the Air Force assumed responsibility for it. When the federal government decided to sell the system to private industry, the task of arranging and managing the sale fell to the Alaska District.

The project involved the assembly of voluminous documents, maps, and legal instruments that described and accounted for the easements, rights-of-way, and other forms of property held by ACS. Every bit of land had to be researched, mapped, and given legal description. Involved were 47 sites, 715 miles of long lines, the microwave system in the Aleutian Chain, and the ocean cable running southeastward to Seattle. Many of the details of this transaction required the most complex negotiations between the District and the Bureau of Land Management, the Federal Aviation Administration, the Alaska Railroad, the Forest Service, and the State Departments of Aviation, Highways, and Natural Resources. When completed in 1971, the sale involved one of the largest and most valuable real estate packages in Alaskan history; the final purchase price paid by RCA amounted to $31.5 million.[47]

SUMMARY AND CONCLUSIONS

During the second World War, Alaska saw the development of a large military establishment for the first time in its history. This development took place under the immediate pressures of the war with Japan, a war that carried hostile forces to Alaskan waters and territory. When those emergency pressures relaxed in the last year of the war, Alaskan forces were partially demobilized. At war's end, however, the changing nature of military strategy (increasingly dominated by nuclear weapons and their delivery by aircraft and missiles) and the deterioration of the relationship

between the United States and the Soviet Union led to a reconsideration of Alaska's place in the national defense posture. This reconsideration ultimately involved the construction of a permanent large-scale military establishment in the region.

The War Department and the Corps of Engineers created the Alaska District for the primary purpose of executing the large scale military construction effort necessary for the development of a permanent military presence in Alaska. The District labored first under the difficulties imposed by inadequate facilities, personnel, and funds; it always had to work under the special difficulties produced by the rigors of the Alaskan climate and the relative isolation of the region. From the vantage point of the mid-1970's, the Alaska Engineer District can look upon the Alaskan forts and bases, their support facilities, the vital early warning systems, and their supporting communications as substantial and enduring testimony to the success of its principal mission in the first twenty-five years of its existence.

Footnotes for Chapter Two

Note on sources for this chapter: Much essential background information for this chapter (as well as Chapter III) was gained from several long interviews with Mr. Warren George who served as chief of the Engineering Division for some 25 years. Mr. George was especially helpful in providing information about the District's problems in the early years of its existence. The material in the chapter also depends in part on historical summaries and memoirs assembled in the late 1960's by an ad hoc organization known as the Alaska District Historical Committee. Most of the figures provided in this chapter are derived from contracts contained in the District files. These are too numerous to cite.

1. Memorandum, Col. J. Lang to CG, Alaskan Department, 1 Feb 46. Located in Administrative Files, USA Corps of Engineers, Alaska District, 1947-51. These are located in GSA Federal Records Center, Kansas City, Mo. Hereafter cited as AFAD.

2. Letter, NPD to Chief of Engineers, 22 Mar 46. In AFAD.

3. Alaska District Historical Committee, "Early Years: Cost-Plus Contract," n.d. This source is hereafter cited as ADHC.

4. 1st Indorsement, Chief of Engineers to NPD, 12 Apr 46. In AFAD.

5. ADHC, "Early Years . . ."

6. Letter, Alaska District to NPD, 5 Dec 46. In AFAD.

7. This was undertaken by the 925th Engineer Aviation Group with District supervision.

8. No B-36 base was ever developed at Clear, but the site was used ultimately for a Ballistic Missile Early Warning Site.

9. Letter, Alaska District to NPD, 5 Dec 46. In AFAD.

10. Letter, Alaska District to AAC, 1 Apr 47. In AFAD.

11. Letter, Alaska District to NPD, 29 Jan 48. (decision to drop the Clear Program) in AFAD.

12. Letter, Alaska District to Chief of Engineers, 21 Feb 48. In AFAD.

13. Letter, Asst. Chief of Engineers to NPD, 18 Mar 48. In AFAD.

14. Letter, Chief of Engineers to NPD, 18 Jun 48. In AFAD.

15. Letter, Resident Engineer to Alaska District Office, 16 Jun 48. In AFAD.

16. USACE, Alaska District (hereafter cited as AD), *Prospectus of Construction, 1948-49*, (Anchorage, 1948), pp. 27-29.

17. Mr. Warren George believed that the District's large lump-sum program was extremely important for the development of large Alaskan based construction firms. (personal interview).

18. ADHA, "Family Housing, Building the Big Bases," n.d. (no date).

19. The following narrative is based on ADHC, "Evolution of Aircraft Control and Warning System," and ADHC, "Sparrevohn AC&W Station," n.d. The figures for construction costs are derived from contract files for the various projects cited.

20. Personal interview with Charles K. Balhiser, project engineer.

21. Alaska District Contract Files, Contract No. DA-95-507-Eng 1957.

22. Figures are compiled from District contract files.

23. *Anchorage Daily Times*, 23 Nov 57, and 23 Dec 57; *Anchorage Daily News*, 2 Jan 58.

24. Report, Alaska District to Chief of Engineers, 24 Dec 61. In AFAD.

25. There was some objection to a government owned generator for Clear. This objection produced an enquiry by both Alaska Senators into the matter on behalf of private utilities in the area.

26. AD, News Release #3992, 1964.

27. Figures are compiled from "Construction Progress Reports," 1946-74. The Seattle District's "Final Report on Military Construction in Alaska," (30 Jun 45) was also used.

28. This portion of the narrative is based on ADHC, "Communications Systems," n.d.

29. The figures are drawn from Department of the Air Force, *The White Alice Network*, (Washington, 1958).

30. ADHC, "Rearward Communications," n.d.

31. ADHC, "Communications Systems," n.d.

32. Letter of Acceptance, Alaska District to North Pacific Division, 4 Dec 46.

33. Address by Lt. General J.H. Atkinson, Commander in Chief, Alaska, 12 Oct 55. In ADL-HF, 1955.

34. E.L. Atkinson, "Alaska Contractors build Difficult Nike Sites," *Excavating Engineer*, (March, 1959), pp. 14-17.

35. AD News Release # 924, 1956.

36. *Anchorage Daily Times*, 7 Aug 53.

37. AD, News Release, #460, 22 Mar 54. Expensive multi-storied housing was required as there was very little suitable area for building in the Whittier region.

38. See, for example, the remarks on the matter made by Senator Bartlett in his Newsletter of 3 May 63.

39. ADHC, "Fort Greely Nuclear Power Package," n.d. While the initial costs of construction were quite high, the cost of operation and subsequent maintenance were quite low owing to the designs of the consulting engineer and the District. See the article by Capt. Francis Wolak in the *Military Engineer,* (Nov-Dec, 1961).

40. ADHC, "National Guard Armories," n.d.; AD News Release #2374, 23 Oct 59.

41. Speech by Col. Christian Hanburger (February, 1961).

42. Associated Press accounts quoting Col. D. Prickett, Test Manager, and Lt. Col. Ben Grote, Deputy Test Manager, 29 Oct 65. See also *Anchorage Daily Times*, 3 Nov 65.

43. *Anchorage Daily Times*, 23 Dec 66.

44. *Anchorage Daily News,* 9 Nov 71.

45. *Ibid.*, 18 Dec 65.

46. USACE, Alaska District, *A Summary of the Corps' Role in Developing the Whittier-Anchorage Multi-Products Pipeline*, (Anchorage, 1967).

47. USACE, Alaska District, *District Information Bulletin*, (February, 1971), p. 2.