II. BUILDING THE ALASKA DEFENSIVE POSTS

THE BEGINNINGS OF WAR IN ASIA AND EUROPE

World War II forced many Americans to revise their perceptions of Alaska. During the early 20th century, much of the nation viewed the Far North as an icebox or a storehouse of natural resources. When the Japanese bombed Pearl Harbor in 1941, however, Americans recognized the vulnerability of the West Coast. In particular, the southernmost islands of the Aleutian Chain seemed dangerously close to Japan. Owing to advances in aviation, which increased the range and striking power of military aircraft, many feared that Alaska would become the next target. In the early 1940s, the remote wilderness of the Far North assumed a strategic importance as protection against the Axis powers, and Alaska became a critical link in the supply route between the Lower 48 and the Soviet allies.[1]

World War II, one of the bloodiest conflicts in human history, resulted from a series of complex events. As the worldwide economic depression intensified, Japanese troops seized Manchuria from China in 1931 and established the puppet state of Manchukuo. The following year, 70,000 Japanese troops landed at Shanghai and forced the Chinese to submit to Japanese economic demands. When the Chinese resisted further Japanese attacks in 1937, Japan launched a large-scale invasion of China — an opening battle in what would soon become a world war.[2]

While the Japanese sought to extend their empire in Asia, Adolf Hitler consolidated his power in Germany. In 1935, Hitler denounced the Treaty of Versailles, signed in the aftermath of World War I and restricting German rearmament, and established a program of military conscription within Germany.

When Hitler sent troops into the demilitarized Saarland the following year, other western European nations condemned the action, but refused to join in a concerted military effort. Italy then forged an alliance with Germany, and in November 1937, the two nations joined Japan to form the Tokyo-Rome-Berlin Axis.[3]

In the spring of 1938, Hitler extended his aggression to Austria and later that year he invaded Czechoslovakia. Again, England and France refused to take military action, and Hitler then invaded Poland. On September 3, 1939, King George VI announced that England and Germany were at war. The "Phony War" that followed became very real in the spring of 1940, when Hitler's armies overran Norway, Denmark, the Netherlands, Belgium, and France in rapid succession.[4]

Until 1939, the United States remained detached from the military conflicts in Asia and Europe. Although strongly in support of the Allied cause, Congress was committed to a nonintervention policy and Americans generally opposed their nation's involvement in European or Asian conflicts. In an effort to protect its non-belligerent status in the early years of the war — while supporting the Allies — the United States initiated the lend-lease program, whereby Americans would lend ships, planes, and tanks to England. Lend-lease, President Franklin D. Roosevelt assured Americans, would keep the United States out of war. Its underlying concept was "Send guns, not sons." As an "arsenal of democracy," the United States, through lend-lease, would help the Allies, while keeping the war on the other side of the Atlantic. Following the German invasion of the Soviet Union in 1941, the offer of arms was extended to Joseph Stalin. This extension of lend-lease solidified and intensified Alaska's strategic location.[5]

Germany's rapid conquests and the creation of the Toyko-Rome-Berlin Axis alerted Congress to Alaska's military vulnerability. Although lacking hard evidence that Japan intended an assault upon American territory, the War Department initiated efforts to strengthen Alaska's defenses. In 1938, the Navy appointed the Hepburn Board, which released a report urging the establishment of seaplane and submarine bases at Sitka, Kodiak, and Dutch Harbor. The following year the Army Air Board recommended that air bases be built in Alaska. The U.S. War Department concurred, developing a comprehensive plan for a military buildup in Alaska. Included in that plan was the construction of a major Army and Air Corps base at Anchorage and the creation of a network of airfields, protected by local garrisons. The Alaska Defense Command (ADC), led

by then Colonel Simon Bolivar Buckner, Jr., was charged with implementation of the plan.[6]

As relations between Japan and the United States deteriorated in 1939, the War Department began to invest heavily in Alaska defenses. The Navy built bases at Sitka, Kodiak, and Dutch Harbor, and the Army commenced construction of bases at Fairbanks, Anchorage, Annette Island, and Yakutat. The Army's construction of airfields reflected the growing importance of air power in military planning, and revealed Alaska's importance on the lend-lease supply route between the United States and the Soviet Union. In 1941, the Corps assumed responsibility for the construction of all airfields.[7] This development marked the beginning of what one historian called Military Alaska.[8]

MILITARY CONSTRUCTION

The Army Engineers' activities expanded considerably during World War II. In 1939, the Corps maintained 12 units, 10 of which were devoted to combat and two of which were topographic. By the end of the war, 700 units operated in the Pacific alone. According to the historian Karl C. Dod, "In few conflicts had military engineers played so important a role as in this one." In general, during war the Army Engineers functioned mostly as technicians. Their duties included surveying and mapping, clearing paths, and operating railroads. Still, as one historian explained, "the engineer soldier is a fighter as well." Moreover, the engineer officer served as "a solider with a knowledge of civil engineering."[9]

World War II changed the Corps' mission in Alaska. In 1941, the engineers were charged with constructing all military projects, combat and non-combat.[10] Throughout the war, construction remained their primary task, and in most theaters of operation, they contended with inadequate supplies. This problem became prominent in Alaska, where engineers confronted especially difficult and "uncommon" working conditions attributable to "the newness of the country." The remoteness of the Far North, its lack of roads, and its extreme weather affected military construction efforts.[11]

In 1939, the Seattle District Engineer appointed Lieutenant Alvin C. Welling as Area Engineer for Alaska with an office in Anchorage. Welling supervised flood control projects and rivers and harbors activities. In 1941, the War Department placed all Alaska military construction under the Corps. The Seattle

District Engineer transferred Major Benjamin B. Talley to Anchorage to replace Welling as Area Engineer.[12]

Talley began his Army career in the mid-1920s as a reserve officer in the Coast Artillery. In 1926, he entered the Corps as a second lieutenant, and his duties took him to Nicaragua, where he worked on a canal survey, and New York City, where he made fire control maps. He also served as executive officer to the District Engineer in Portland, Oregon.[13]

Talley started in Alaska as the Resident Engineer at Yakutat, with the rank of captain. He was promoted to major prior to his new posting in Anchorage. From January 15, 1941 to May 1, 1942, Talley represented the Seattle District Office and was in charge of all construction work prosecuted for the ADC. On May 1, 1942 the Area Engineer became known as the Officer in Charge, Alaska Construction. Although Talley continued the same duties, he became a member of the staff of the ADC. Talley remained in the Anchorage office until June 1943, when he left for the European Theater. His decorations and awards included the Distinguished Service Cross, Distinguished Service Medal, and Legion of Merit. During his tenure in the Anchorage Office, he functioned as the first District Engineer for Alaska, although he did not receive that title.[14]

Talley recalled that his position as Area Engineer, rather than District Engineer, suited him. "Seattle does my procurement," he explained. "Seattle handles my personnel problems. They handle my administrative work. Why send all of those people to Alaska in the middle of a war to do all that sort of thing which could be done so much better in Seattle[?]" He concluded that "it would have been a mistake" to create a district in wartime Alaska.[15]

Talley proved to be a capable, energetic, enthusiastic leader of the Alaska Engineers. Under his supervision, the engineers completed the airfield garrisons for Alaska's defense, expedited the transportation of supplies and equipment by sea and rail, and built the bases from which the United States launched offensive strikes against Japan.

Talley also brought a sense of urgency to the Alaska engineering work. Recognizing that transportation was a critical problem in Alaska, he directed the construction of the infrastructure essential to the expeditious movement of men, supplies, and equipment. He pressured the Alaska Railroad and the harbor superintendent at Seward to improve the transshipping facilities. He prepared plans for rehabilitating Anchorage harbor to relieve the overtaxed Port of Seward.

In addition, Talley pressed the work at Whittier to early completion. When he needed transportation for construction in the Aleutian Islands, Talley scoured the harbors for every available tug, barge, scow and fishing boat that could haul cargo and formed them into an "engineers' Navy" to complete the work.

Talley worked directly in the field and maintained an aggressive approach to construction projects. At times, he risked his own life to get firsthand information. He flew under extreme conditions — more than 900 hours in two and a half years — to investigate Corps project sites. One particularly harrowing experience occurred on a flight to Kodiak. The plane was about 75 miles south of its destination when one of its engines quit, forcing the pilot to land on rough seas. After one of the pontoons gave out, the plane started filling with water. The nine men aboard spent the afternoon bailing with buckets — and all were aware that the plane carried only seven life vests. As Talley recalled in 1979, "a lot of human traits come to the surface" in such emergencies. When a small boat arrived to rescue Talley, a passenger expressed fear that he would be left behind. Talley made certain that he got aboard the boat first. Later, the other men were also rescued. Talley further remembered a plane that hit a "williwaw," a horizontal cyclone that tore off both wings.[16] Flying in wartime Alaska remained a hazardous activity. As one pilot summarized in 1943, "One meets such fine people, such horrid weather and such ancient planes."[17]

Talley participated in the reconnaissance of the Aleutian Islands when the Japanese held Attu and Kiska, and he joined the combat troops who landed on Attu. Years later, he remained proud of his part in the offensive in the Aleutians. In 1979, he was glad to note that the Corps had "succeeded so far in remaining a combat arm." According to him, "We don't want to be a service. If we were ever to become a service, many of us would never stay with it. We've always taken pride in the fact that we're also combat soldiers."[18]

Talley not only established the administrative foundations of the future Alaska District but also established a tradition of experimental engineering in the difficult and severe climate that would distinguish the engineers in Alaska. He kept a daily log, which outlined the genesis of the Alaska defense system, the military emergency that followed the Japanese attacks on Pearl and Dutch harbors, and the living and working conditions of those charged with rapid construction of complex facilities under trying conditions.

His descriptions of working in Alaska reveal the region's distinctive environment as well as the Corps' difficulties in completing construction. At Fort

TRANSPORTATION BY PLANE

Chiniak Point to Anchorage, March 26, 1941

"There were 7 passengers in the ... Travelaire with a 450 hp engine. It took a run of more than a mile to get off the water and we had bad weather on the way to Anchorage. The ceiling got lower and lower until finally we were just skimming the top of the water with the clouds about 25 feet above. We finally made a landing at Cook Inlet to take a look at the weather. However, when we sat down on the water we could see that there was a slight space between the water and the clouds which was sufficient for an airplane to get through ... Weather was much better at Anchorage and the landing was made without incident."

Yakutat to Seward April 11, 1941

"We continued to the westward, but as we progressed the weather continued to get worse — heavier rains set in until ... finally we reached the entrance to the Passage Canal, we did not attempt to enter but turned south. ... We flew southward for 15 minutes and the weather by that time had gotten so bad that we turned north and flew for 10 minutes. The weather seemed just as bad to the north as to the south so we again turned south ... [where] we were forced close to the water. ... We turned back and ... landed at Cordova in a strong wind and blinding rain. ... Held by weather in Cordova [12 and 13 April, 1941]."

Cordova to Seward 14 April 1941

"The pass was closed and it was snowing on the ice caps at the head of Passage Canal. We made two attempts to get through and found it impracticable. ... The pass is only 500 or 600 yards wide and as it is necessary to make a turn in the pass, one does not dare fly through on instruments unless at a very high altitude. The plane we were in was not so equipped. We circled for 5 or 10 minutes ... then landed at the head of the Canal, remained on the ground about an hour and then took off ... and landed in Knik Arm at Anchorage. ... The account of this trip is given in somewhat detail in order that the conditions of flying by the Area Engineer may be known at the District and in the Division Offices."

Umnak Island to Anchorage, June 27, 1942

"We circled inside Ekutan Bay for about a half hour in the fog, trying to find an outlet, finally went through False Pass to the Bering Sea side and flew north along the coast at about 25 feet, but it was clearly impossible to find Cold Bay in the fog so we climbed up through and came up on top at 7,000 or 8,000 feet and then continued on to Naknek where we landed for gasoline. The plane was piloted by Ferry Command pilots who had never before been to Umnak or Cold Bay, and the pilot had been in the service about 30 days. Under these conditions, if one is not careful he is prone to grow gray rapidly."

... from Talley, "Logs"

Richardson near Anchorage, he reported that "there is scarcely a building under construction ... that is not handicapped by the absence of some material or other." Problems included a lack of paving machines, finishing machines, and adequate trucks. This complaint became a litany, as the Corps developed major bases at remote, previously undeveloped sites.[19] At Yakutat, for example, Talley received six small tractors "no bigger than a D-2." Although these were "standard" Corps equipment, they proved inadequate at this site. Talley's response was sarcastic and to the point. "I thanked [the Army] for the toys," he recalled, noting that "we would wear them on our watch chains and dangle them from there." He then requested tractors "that were big enough to do something."[20]

Alaska's weather remained an inconvenience, slowing the delivery of supplies, impeding work, and hampering already insufficient work forces. Fog and ice further hindered delivery of equipment. It rained for weeks at Yakutat in the fall of 1940, and 15 men became ill, resulting in "the loss of man power." The temperature sometimes plummeted below 70 degrees below zero Fahrenheit, and at Tanacross in 1943, Talley reported that, owing to the bitter cold, "very little outside work was ... accomplished." At times, the weather became debilitating, causing accidents, and the destruction or abandonment of nearly completed facilities. At Amchitka Island, high seas frequently washed out a jetty under construction. Similarly, at the small garrison at St. Paul in the Pribilof Islands, "rough seas, and ice floes" destroyed boats and roads, compelling the Army to abandon the site.[21]

Muskeg and permafrost further complicated construction. At the Yakutat site, Talley reported that carryalls, vehicles used for hauling, lacked the traction to convey even half a load through the muskeg for dumping. Moreover, the muskeg packed against the tailgate, moved forward out of the carryall in a single mass, became lodged between the front wheels and the body of the carryall, and high centered the machine.[22] Problems were not limited to the carryalls: "Nightfall [December 7] found one tractor out of service on the field due to the front hoisting clutch going out. The Bay City shovel was stuck in the middle of the runway, and the other tractor working on the road to the dock was bogged down on its nose, having slid down the hill — the ground having given way underneath it."[23] The Model M tractors provided by the Seattle District also proved to be a great disappointment. Talley noted that although the tractors would be valuable for use in farms and orchards, they remained "unsuitable for use in muskeg."[24]

Alaska's weather, isolation, and terrain affected not only the timely completion of projects, but also the morale of the men confined for long periods to isolated sites. "The grinding monotony of the Arctic winter was upon us," reported one specialist sent by the Army to evacuate civilian personnel in the Pribilof Islands. "For the next few months we would have a steady diet of shrieking winds and driving snow. The winds could work on your nerves like a file." He concluded that "the isolation such as St. Paul afforded could produce insanity."[25]

Similarly, Colonel James D. Bush, Jr., Chief of Operations of the Construction Division, Engineer, Alaskan Department, complained that "the maintenance of morale among civilians, as well as troops was a difficult problem at isolated camps and stations where no recreational facilities were available." A representative of the Morrison-Knudsen Construction Company, for example, "preferred to get out of Cold Bay," because "his men had been there a long time, working long hours, seven days a week, and their morale was beginning to drop." According to Colonel Carlin H. Whitesell, who was stationed at Adak, construction crews on this Aleutian Island in 1943 "were in a bad state and definitely should be taken out of there." Within a 30-day period, Whitesell had witnessed "5 cases of psychoneurosis evidenced by an extreme depressive condition among his men who have been in Alaska more than 2-1/2 yrs. Five men were evacuated, one had attempted suicide and another sometime before had actually committed suicide."[26]

Long hours and short leave resulted from a chronic shortage of personnel. Construction crews generally consisted of civilians associated with private construction companies, other hired civilians, troop labor from a variety of military agencies, and engineers from the Corps. Personnel from the Corps frequently provided the expertise rather than the labor. Talley, for instance, described the 29th Engineers as a "highly specialized unit, streamlined and stripped down and ... barren of men of the type generally placed on post fatigue, labor details, and other post overhead." When it was practical, less technical construction jobs were tendered to Alaska residents. For all this diverse and extensive labor pool, at Yakutat Talley reported "a crying need for additional men, the urgency of which can scarcely be overemphasized." Similar complaints were voiced at Passage Canal, Umnak, Adak, Anchorage, and Seward. Longshoremen and stevedores also remained in short supply, prompting Talley's frequent petitions for a labor battalion for the unloading of supplies.[27]

In addition to these problems, the men were required to work at a quick pace. During the construction of Yakutat Field, for instance, the crew enjoyed a Thanksgiving dinner in a mess hall that was unfinished. "When the cooks were preparing [the food] in one end of the building," Talley recalled, "the troops were putting the roof on the other."[28]

ALASKA NATIVES AND THE CORPS

Alaska Natives provided the Corps with critical knowledge of the unique terrain and weather conditions of the Far North. The Alaska Scouts, "a provisional organization made up of Alaskans, both white and native," accompanied Talley on reconnaissances of the Aleutian Islands, within range of Japanese forces. Talley described this organization as "men experienced in the North Country." As he observed in 1942, these men acted "as we are led to believe the scouts conducted themselves on the western plains after the Civil War. Some have not shaved for months; however ... they wash each time they shave. Their uniforms are as individual as themselves and their weapons also, but they are an excellent soldiery and deserve the name, 'Castner's Cutthroats.'" Accordingly, Talley sometimes preferred them for reconnaissance work.[29]

Employment of resident and Native Alaskans, the military's purchase of local construction and food supplies, and the development of transportation facilities at previously undeveloped or sparsely inhabited sites, wielded a significant and long-lasting impact on local economies and social structure. At Anchorage, rumors of layoffs at Fort Richardson in the spring of 1941 became a source of great local concern. At Passage Canal, Talley reported that "a town will probably be built at the head of the Passage Canal at some future date and provision must be made in the layout of the terminal facilities for such an eventuality." At Nome, engineers conducting a survey found that the price of dinner had doubled in a week, "probably in honor of the work which the people ... feel is going to commence here." Natives employed at the Yakutat airfield in February "were a little more prosperous" than they had been at the first of the year. At Bethel, a garrison for more than 700 men was proposed adjacent to an "urban" center of 300 within an area described as uninhabited "with the exception of native villages." Here fox trapping was the work of winter, and fishing the work of summer. Of more long-term impact was the development of airfields, roads, docks, and industrial facilities converted to civilian use at the end of the war.[30] At Yakutat, Talley and Peter Lawrence, a Tlingit, "became very, very close

friends." According to Talley, Lawrence's grandson argued that "one of the best things that ever happened to Yakutat was the soldiers coming there." The Army, he continued, "had completely changed the people," in part owing to the employment that the Corps brought to the area.[31]

TYPES OF CONSTRUCTION

Much of the Corps' work in Alaska involved the construction or expansion of airfields. While runway, taxiway, and revetment design remained similar throughout the territory, construction methods differed considerably within the three distinct regions: coastal, interior, and along the Aleutians. In the coastal areas of Yakutat and Annette Island, muskeg — often 18 inches deep — became the greatest obstacle to construction. Within the interior, permafrost posed the greatest difficulty. Once a flat, stable surface had been achieved through the thawing of the permafrost, excavation of muskeg, and addition of fill, runways were covered with a variety of materials. According to Talley, the "most difficult and spectacular work" was conducted in the Aleutian Islands, where limited space and high seas often required constructing protective dikes and jetties and, on Adak, razing several small hills to allow a clear approach. Runways were surfaced with the most readily available material meeting the anticipated load requirement — generally gravel, concrete, asphalt, crushed pumice, volcanic cinder, or rock. In February 1942, steel runways were introduced in the Aleutians. These structures, consisting of runway mats of pierced steel planks, were laid on a suitable base, generally sand fill. The runways, "considered a stunt" when first attempted at Fort Glenn on Umnak Island, were quickly installed.[32] Capable of supporting heavy bombers, they became "a highlight of Alaska airfield construction."[33]

The Corps also constructed docks at the military bases and at central embarkment points from which supplies were routed to construction sites. Sunken barges and steel-pontoons provided makeshift docks, used at isolated construction sites for the initial delivery of goods. Permanent facilities varied according to the site and anticipated use. Due to inadequate marine-repair facilities within Alaska, support facilities for airfields and harbors included bargeways, woodworking, machine, and welding shops. These facilities were primarily used to maintain floating plants required during construction, and they serviced the small craft used in harbor patrols and the supply of outposts and minor stations.[34]

TYPES OF CONSTRUCTION

Yakutat, November 21, 1940

"A recommendation was made to the District Engineer that the cross section of the runway consist of a fill above the surface of clean gravel to a depth of crown of 30 inches in the center of the runway, the concrete strip to be 6 inches thick in the center and 8 inches thick at the edges as in the case of the runway at Ladd Field, Fairbanks, and possibly at Anchorage. ... Under this condition there will be a depth of fill of 24 inches in the center of the runway, tapering to a zero fill 250 feet on either side of the center line, beyond which for a distance of 20 feet will be a flat shoulder, beyond which will be the borrow, beyond which in turn will be the spoil heaps of muskeg from the runway and borrow areas. ... The District Engineer and Division Engineer tentatively approved this cross section, such approval being predicated upon satisfactorily lowering the water table by means of the side ditches obtained by borrow. Such ditches will be approximately 10 feet deep."

Yakutat, December 22, 1940

"Should this [S-45-W] runway be constructed to its full 10,000 ft. length ... either one of two things would be necessary: first, [the] woods would have to be cleared to the width of the runway for a distance of about 800 ft. or the runway would have to extend the same distance beyond the point of its intersection with the S-45-E runway. ... There is a definite change in the nature of the soil at about 5,000 ft. on this runway. From the intersection of the two runways to 5,000 ft. the runway is on fairly solid ground except for the crossing of a small stream. ... At about 5,000 ft. and 6,000 ft. about 25% of the area appears to be under water all the time, and at 7,400 ft. there is a small patch of woods through which a small stream runs. The bottom of this stream instead of being gravel is black mud, probably waist deep; and from this point on to 10,000 ft. the ground is soft and marshy ..."

... from Talley, "Logs"

Most military construction sites were located outside the territory's limited road network. All sites required the construction of roads from the beach, railhead, or "highway" terminus to the project. Roads, as Colonel Bush explained, became a "vital link ... and their importance cannot be overemphasized."[35] Although design varied greatly in response to local conditions, all roads were constructed by bulldozers, carryalls, shovels, and trucks, run by either civilian or troop labor.[36] Construction was the most difficult in the coastal areas — particularly Annette Island and Yakutat, where the muskeg swamps were "unusually deep," requiring excessive fill or log-corduroy construction. Work also proved difficult in the Aleutians, where the muskeg alternated with rocky terrain.[37] By the end of 1943, when Alaska's defensive and offensive posts neared

completion, approximately 1,129 miles of road had been constructed at the Alaska projects.

In 1940, Alaska's population centers included Juneau, Anchorage, Fairbanks, Nome, Dutch Harbor, Kodiak, Sitka, Cordova, and Ketchikan (Annette Island). These contained only minimal civic facilities and limited housing. The major air bases, airfields, and garrisons near these communities thus required construction of massive housing compounds. Facilities were generally limited to ten types of prefabricated housing units, most patterned after Quonset huts.[38] These structures, Talley explained, featured "a prefabricated floor built in sections. The frame work is of metal lined on the inside with masonite or other suitable material, on the outside of which is a blanket of insulation. ... The outside covering consists of corrugated iron roofing nailed on."[39] Manufacture of the Quonset hut required the use of "critical" wartime materials, and was largely discontinued following development of the Pacific hut.

The Pacific hut, made available as Alaska construction peaked, "proved to be invaluable as a substitute for the several types then in use." The prefabricated wooden structures, shipped to Alaska from a Seattle factory, could be "erected by inexperienced labor, all materials cut and assembled at the site."[40] These sparse, yet practical and transportable, buildings were used for the houses, mess halls, latrines and baths, administration buildings, bakeries, laundries, dry cleaning, shoe repair shops, and recreation buildings, generally called "facilities" in construction reports.[41]

CONSTRUCTING THE MAJOR ALASKA DEFENSIVE GARRISONS

Between 1940 and 1942, the Corps supervised construction of garrisons and of airfields associated with lend-lease. These facilities marked the first phase of Alaska military construction during World War II.[42]

Ladd Field

In February 1940, the Army ordered the conversion of Ladd Field near Fairbanks from a cold-weather testing station to a combat airfield. This construction, to be completed by the Army's Quartermaster Corps, included a single concrete runway, administration and housing facilities for over 500 officers and enlisted men, 6 buildings for technical use, a Medical Corps building, tactical gasoline and oil storage, necessary utilities, roads, drainage, parking apron, and

a railroad spur from Fairbanks. When the War Department transferred all Alaska military construction to the Corps on January 15, 1941, work at Ladd Field was 85 percent completed.[43]

Following the initiation of lend-lease, Ladd Field became the western terminal of a chain of airfields that ran from Great Falls, Montana, across Canada, to Alaska. The War Department authorized additional construction at Ladd Field designed to facilitate the Army's expanded use of the field as an air subdepot for repair and testing of planes. It also authorized the Air Transport Service's use of the field as a station for ferrying planes to Russia. The new construction included a ground garrison camp for 280 officers and enlisted men, a motor repair shop and utilities, gasoline reserve storage tanks, and an air depot for 911 officers and enlisted men with necessary technical facilities and utilities. To support the Air Transport Service, the authorization included Ferry Command housing for 500 transients, an additional 7,200-foot long runway, four Birchwood hangars, two Kodiak hangars, and housing for over 2,000 Air Transport Command (ATC) personnel. Hired labor working under, in turn, Resident Engineers Colonel James D. Bush, Jr., Colonel Virgil M. Womeldorff, and Captain E. D. Tracy completed the additional construction at Ladd Field.[44]

The extreme cold in the Fairbanks area tested the men, materials, equipment, demanding innovative construction techniques. Although supervisors planned the work so that the crews could work inside when the temperature fell below -30 degrees F, workers labored in constant danger of severe frostbite. Although stripping and excavating for runways and building sites was always a slow process, in winter the ground frequently had to be thawed by steam before it could be excavated. At times, the permafrost under roads, air strips, and buildings thawed after the construction work was completed, and the structure collapsed. When such thawing occurred, the workers had to remove the semi-frozen earth to a depth of up to 15 feet or change the building site.[45]

By the early months of 1943, the large numbers of planes being ferried to the Soviet Union under the lend-lease program had overtaxed the facilities at Ladd Field, and the ATC requested additional space. In response, the War Department authorized the construction of a satellite field 26 miles southeast of Fairbanks (now Eielson Air Force Base).[46] The Mile 26 Satellite Field, built according to plans approved by the ATC, included housing for over 400 men, warehouses, utilities, technical facilities, two asphalt runways, and a Birchwood hangar. As at other Alaska locations, the construction workers stripped the muskeg from the

surface of the area, and, owing to the high water table, used a large amount of fill to raise the air strips and parking areas to a safe level.

Captain Edward D. Tracy, Resident Engineer, and his assistant, Lieutenant Edmond L. Powers oversaw the construction at Mile 26 Satellite Field. Morrison-Knudsen Company of Boise, Idaho, contracted for the entire project.[47]

Fort Richardson

In the summer of 1940, the Army began construction of its principal permanent base in Alaska, Fort Richardson/Elmendorf Air Force Base near Anchorage. The site was selected for its location, climate, and accessibility. Although the weather at Fort Richardson is not as mild as that in the panhandle, the area is not subjected to the persistent storms of the Gulf of Alaska or to the extreme cold of the interior. Transportation facilities also favored the Fort Richardson site. The Alaska Railroad is located adjacent to the fort, and nearby Cook Inlet is open to ocean-going vessels six months of the year.

The original construction schedule included two concrete runways and aprons, one temporary and three permanent hangers, Air Corps gasoline storage and fueling facilities, and concrete igloos for both Air Corps and ground troop bomb and ammunition storage. Support facilities included administration units, housing for a garrison of approximately 7,000 men, a 294-bed hospital, a 7,000,000-gallon-per-day gravity water system, and other utilities. The construction plans also included the rehabilitation and extension of Anchorage harbor facilities, leased from the Alaska Railroad.

The Quartermaster Corps began work at Fort Richardson in 1940, and had completed approximately 80 per cent of the originally authorized work when the Corps of Engineers took over the project in January of 1941.[48] Talley, the newly appointed Area Engineer, assumed supervisory responsibility for the Fort Richardson Project. Immediately, Talley identified problems with the site plan for the base:

> Preliminary lay-out for the air base ... calls for the erection of a structure (water tower) 150 feet high in a dangerous position and the congestion of the water system, fire station, powerhouse and heating plant, gasoline storage, and other utilities in one small area, thereby forming a concentrated target in the event of air attack.[49]

The site plan was modified to allow for greater dispersement and less conspicuous placement of utilities.

Talley also discovered that sewage from Fort Richardson ran into an open cesspool. The frozen ground served to keep the waste contained, but he feared that when the spring thaw came, the sewage would run into Ship Creek, Anchorage's water source. The engineers therefore laid a pipe to carry the sewage away from the stream.[50]

Following the Japanese attack on Pearl Harbor, the Army enlarged the facilities at Fort Richardson as part of the nation's military mobilization program. In December 1941, the "Program of Additional Construction" authorized additional housing and facilities for approximately 250 officers and 7,500 enlisted men, a 417-bed hospital, warehouses, and technical facilities. In 1942, the Army added the construction of a war-reserve gasoline storage system consisting of four 24,000-barrel tanks and four satellite airfields with revetments and taxiways. In the spring of 1943, the Army authorized construction of a 400-unit Alaska air depot consisting of hangars, warehouses, technical and administration facilities, and a civilian housing compound for nearly 900 employees.[51]

Fort Richardson's first Resident Engineer, Captain A. C. Welling, directed the construction work, using the "purchase and hire" method for most projects. Exceptions, which were constructed under contracts, included the central heating and power plant, water tower, and tactical gasoline storage and fueling system. In turn, Colonels Craig Smyser and Maybin H. Wilson succeeded Welling. Construction at Fort Richardson reached a peak in August 1941, when a total of 3,415 contractor workers and civilian government workers were employed.[52]

In contrast to other Alaska sites, the Corps encountered moderate construction problems at Ft. Richardson. Frozen ground and low temperatures created the most persistent problems. Fort Richardson sits on a glacial moraine of sand and rocks overlaid with 6 to 12 inches of topsoil and approximately 8 inches of moss. Because the frost penetrates deeply into the soil, engineers had to bury sewer and water lines 7 to 9 feet below the surface. However, the porous gravel base allowed water to drain from the surface thereby preventing serious frost heaving.[53]

DEFENDING THE PANHANDLE

In 1940, the Corps commenced construction of airfields at Annette Island and at Yakutat and of a defensive garrison at Fort Ray, near Sitka. Two years later, they enlarged the Chilkoot Barracks near Skagway. The two fields and the garrisons were designed to protect the panhandle. The airfields also served as intermediate landing fields for planes being ferried from Seattle to the Alaska interior.

Annette Island Air Base

In July 1940, the War Department authorized the Corps to construct an airfield at Annette Island, approximately 30 miles south of Ketchikan at the extreme southern tip of the panhandle.[54] The original program, under Resident Engineer Major G. J. Nold, called for the construction of the six-mile Metlakatla Road between the airfield and Ketchikan, two 5,000-foot by 200-foot macadam-surfaced runways and associated aprons, taxiways, hangers, and fuel storage facilities. The field was designed to accommodate both bombers and pursuit planes. The engineers later widened the runways to 300 feet and extended one of them to 6,000 feet.

During the early 1940s, the War Department expanded the Annette Island airfield from an intermediate landing field into an extensive military installation. Additional facilities included a seaplane ramp with parking areas constructed for the Navy; oil, ordnance, and bombsight storage facilities; miscellaneous camp facilities; revetments for Air Corps bombers and pursuit planes; service roads; taxiways; and four Panama Mounts for the Coast Artillery battery. The Corps also constructed facilities for the Royal Canadian Air Force (RCAF) who joined the Americans at Annette Island. When completed, the Annette Island airfield provided administration and housing facilities for over 200 officers and nearly 3,500 enlisted men, and extensive warehouse capacity.

The Corps used troop and hired labor to accomplish its work on the Annette Island Project, which was completed May 1, 1943. Major Nold, the first Resident Engineer, was succeeded by Lieutenant Colonel Fisher S. Blinn and Major Rollo J. McKinney. Nold received the Legion of Merit for his efforts at Annette Island.[55]

Muskeg proved to be the most difficult problem faced by the engineers at Annette Island. This material had to be excavated prior to construction of heavy

structures such as hangars, boilers, powerhouses, or fuel tanks. Crews also had to lay 18 to 25 feet of fill to provide a stable base for taxiways and runways.[56]

Yakutat Landing Field

On September 30, 1940, the War Department authorized construction of the Yakutat Landing Field, 420 miles north of Annette Island on a peninsula extending into the Gulf of Alaska northwest of Juneau.[57] The area is level, and heavy stands of Sitka spruce and hemlock appear in the northern part of the military reservation. Glacial silt and gravel 30 to 50 feet thick lie beneath the overburden. Muskeg, one to two feet thick, generally saturated with water, covered the main camp and severely hampered construction efforts. The area could be traversed only with a tracked vehicle, and carryalls and D-8 bulldozers encountered extreme difficulties when stripping the muskeg.[58]

The original orders authorized the construction of: a 1,200-foot road from the 6-mile long Yakutat and Southern Railroad to the camp area; two concrete runways; quarters, barracks and a mess hall for 2,000 enlisted men and 125 officers; an operations building; fuel storage and service areas; radio facilities; one steel truss hangar; over 100,000 square feet of storage; and aircraft revetments. On Monti Bay near Yakutat, the engineers constructed wharf facilities and a warehouse. At Yakutat, engineers used the natural resources of the area to good advantage. With local timber they built bridges, foundations, and other works requiring heavy timber. They installed a gravel washing plant that produced adequate aggregate for all the concrete used in runway and building construction. To haul heavy materials to the construction site, they used the nearby railroad owned by Libby, McNeill and Libby.[59]

Colonel Talley, Resident Engineer of the project, arrived at the village of Yakutat aboard the U. S. Army Transport *Etolin* out of Seattle on the evening of October 23, 1940. The sky was clear and the wind was calm, although the ship had passed through rain squalls during the day. Workers immediately began unloading the construction equipment from the *Etolin*, including one Bay City shovel, two D-8 Caterpillar tractors, four LeTourneau carryalls, one Ford-Sullivan compressor truck, one motor grader, and two cargo trucks.[60]

Characteristically, Talley wasted no time getting to work at Yakutat. By October 28, he had settled the men in camp, constructed a ramp to load the heavy equipment on flat cars to haul to the work site, reconnoitered a site for a wharf and a site for the landing field, and moved one D-8 tractor to the camp

site, ready for use in the construction of a 1,200-foot road from the railroad to the airfield.[61]

The construction of the road between the railroad and the camp tested the equipment in muskeg. Talley calculated that a D-8 could strip about 3,600 square feet of muskeg in an 8-hour shift.[62] The motor grader proved far less useful. On the morning of October 30, the grader bogged down before the operator could move it from the railroad right of way, and Talley feared that the machine would be limited to doing finishing work and knocking down high spots in roadways already stripped and graveled.[63]

The skies over Yakutat remained clear the following days, and the roadway dried sufficiently to allow a further test of the grader. The roadbed supported the grader except in areas where muskeg had become mixed with gravel. To solve that difficulty, the engineers removed the entire problem section of the road and replaced it with clean gravel. However, they left muskeg in some areas of the road to determine the ultimate outcome of using muskeg mixed with gravel.[64]

To excavate extensive areas and to remove the overburden from the work area, Talley had ordered LeTourneau carryalls. On November 2, he tested an empty 10-ton carryall on the muskeg. Where the D-8 tractor sank from two to six inches, the carryall sank from four to twelve. In many places the machine bogged down, causing the bed to drag even when set in the elevated position. While the carryall picked up unworked muskeg satisfactorily, it was only with great effort that the operator was able to guide the loaded machine across the muskeg.[65]

The good weather held throughout the first weeks of November, and the muskeg dried sufficiently to burn. Stripping the muskeg with bulldozers proved to be easier than it had been when the muskeg was soggy. To clear the muskeg from the work areas, Talley began experimenting with an elevating grader. This machine scooped the muskeg onto a conveyor belt that carried the material to the side, where it was dumped on the ground or loaded into a truck or carryall. Talley concluded that "the operation of the grader is satisfactory ... and presents the best solution considered thus far for the removal of muskeg from the runways and parking apron."[66] However, the elevating grader only partially solved the muskeg problem. Talley still had not found a piece of equipment that could receive the muskeg from the grader and haul it to a suitable spoils area. He recommended crawler trailers, pulled by D-8s.

The terrain at Yakutat posed additional unanticipated problems. While clearing trees at the intersection of the proposed runways, a D-8 tractor sank into the muck. By jamming planks under the tracks, the men were able to provide a solid base for the tractor to pull itself out of the hole. Upon further examination, the engineers found that the soft spot, possibly caused by a spring, extended diagonally across the intersection of the proposed runways. Although the engineers considered changing the runway location by up to 500 feet to avoid the soft area, a more thorough inspection of the site — ordered by Talley — revealed that only a slight shift of a few feet in the center line of the runway was necessary to avoid the problem.[67]

During his first two weeks at Yakutat, Talley had begun to find solutions to the difficulties of constructing in muskeg. Fortunately, there was no rain between October 30 and November 11, and the ground surface dried. On November 12, however, Talley and his crew woke to four inches of wet snow on the ground, rapidly melting in the steady rain. Throughout the following weeks rain or snow continued on a daily basis, flooding the work area and saturating the muskeg. Water stood six to eight inches deep on large sections of the runway areas. By November 18, the operators had to exercise extreme caution to prevent their equipment from bogging down. Talley ordered the operators of the two D-8 tractors to work closely together so that one could extract the other from the muck.[68]

In order to remove the surface water from the work area and to prevent future flooding of the runways, the engineers began work on a drain system through which they hoped to drop the water table at least three feet below the bottom of the runways. Talley assigned the two D-8 tractors to work on the drainage system during the night shift. The crews used the D-8s for clearing the wooded area during the day. The ditches drained the runway area, and the operators found it much easier to operate the excavating equipment. But the tractors became stuck so often that Talley reassigned the D-8s to the dayshift, hoping that operators working in the daylight would be better able to avoid exceptionally boggy areas. The rain proved to be a source of delay. At times, more than six inches fell in a 24-hour period and water inundated the work area. During the winter, heavy snowfall retarded construction. Still, workers in Yakutat rarely suffered from the bitter cold that was typical of the interior, as temperatures at this location generally did not drop below 20 degrees.[69]

After Talley's transfer to the Area Engineer's office in Anchorage in January 1941, Major Frank J. Loomis, Mr. Seymore Standish, Captain Milton A. Lagergren, Captain Charles A. Block, and Colonel Charles F. Baish, in turn succeeded him and supervised completion of the project. Loomis received the Legion of Merit for his work.[70]

Fort Ray

On October 11, 1940, the War Department authorized the Quartermaster Corps to construct Fort Ray to protect the Navy base at Sitka.[71] The garrison included administrative, domestic, and hospital facilities on Charcoal and Alice islands. In January 1941, the Corps assumed responsibility for additional construction at Fort Ray, including construction of warehouses, cold storage buildings, repair shops, fuel storage tanks, and numerous support facilities. The engineers also installed fixed-defense facilities for the defense of Sitka Harbor, including three six-inch batteries, searchlight positions, fire control appurtenances, seacoast radar installations, and 90 mm anti-motor torpedo boat batteries.[72]

Material, equipment, and manpower shortages, and changes in the administration delayed the completion of this project. Initially, the Navy contractor, Siems Drake Puget Sound, contracted for the project. The Navy terminated that contract, and replaced the contractor's personnel with Navy construction battalions. The Navy then withdrew its construction battalions, and a small engineers' maintenance battalion resumed the work.[73]

Chilkoot Barracks

Chilkoot Barracks was the only active Army garrison in Alaska in 1938. Located near Skagway, the post had been established during the gold-rush era, when the Army had been sent to Alaska to assist in maintaining order.[74] World War II-era construction at Chilkoot Barracks, authorized by the Western Defense Command (WDC) on October 31, 1942, augmented the existing facilities. Under the direction of Resident Engineer Captain Emil F. Gehri the construction program included additional warehouses, a concrete igloo, fencing, camouflage, extension of utilities, and road improvements. The workers faced no difficult construction problems, although severe winter weather and inadequate shipping facilities delayed the delivery of construction materials and supplies.[75]

THE INSTALLATION OF THE AIRCRAFT WARNING SYSTEM (AWS)

The installation of aircraft detection equipment along the Alaska Coast became a critical component of Alaska's defense against invasion from the Pacific. In May 1940, the Commanding General of the WDC directed the Commanding General of the Ninth Coast Artillery District to study potential sites for detector installations.[76] Lieutenant A. C. Welling, Area Engineer at Fairbanks, Lieutenant W. N. Snouffer, Signal Corps, and a civilian radio engineer surveyed the coastal region and selected sites at Sitka, Cape Hinchinbrook, Cape Chiniak, and Unalaska Island for the proposed Aircraft Warning Service (AWS) installations. In addition, they identified a site for a mobile detector near Fairbanks and recommended building an information center to filter reports of the several AWS sites near Anchorage. Between 1940 and 1941, the War Department authorized construction of all facilities recommended by the Corps as well as the installation of additional detectors at Unalaska, Hinchinbrook, Lazy Bay (Kodiak), Nome, Metlakatla, Nushagak, and Yakutat. After war was declared in December 1941, the War Department directed the ADC to construct detector sites as needed; in March 1942 (at the recommendation of the Eleventh Air Force), the War Department recommended additional information centers at each major air base in Alaska.[77] The Corps was responsible for the location of the sites and for much of their construction.

AWS SITES

Anchorage, June 7, 1941

"It has been the experience, heretofore, that a considerable time measured in months elapses before any further action is taken, and after the plot plan has been approved, the buildings and so forth are designed for this site and then when these are finally designed authority is obtained for the actual construction and work may commence. But in the meantime so many months have passed that the people connected with the work have lost interest in it because of the pressure of other things, and each time the question comes up it is necessary to go back over the work that has already been done to find out what has actually been accomplished."

...from Talley, "Logs"

Once a plot plan had been prepared and approved, months often passed before construction was initiated. Talley successfully petitioned the WDC to streamline the process by granting the ADC and the Area Engineer authority to approve the plans for the AWS facilities.[78]

The Corps built the AWS cold storage buildings and housing for the stations and furnished diesel generating plants. The Signal Corps supplied the steel detector buildings and the antenna towers. Troops built the stations at Lazy Bay, Cape Wislow, Nikolski, Cape Frosty, Yakak, Tagalak, Adagdak, and Deer Island, and civilian labor

worked on the stations at Sitka, Yakutat, Cape Chiniak, Outer Island, and Jeanie Point.[79]

The AWS detector stations were designed to provide minimum warning of the approach of hostile aircraft to the Navy bases at Sitka, Kodiak, and Dutch Harbor and the Army bases at Fort Richardson and Ladd Field. The information collected by the detectors was transmitted to Anchorage, where it was disseminated to Army and Navy sites. The first detector units required high promontories and a 360-degree sweep.[80] As a result, the sites were usually located some distance from direct means of transportation, and they were frequently accessible only by water. The shortage of floating equipment in Alaska and the stormy seas added to the difficulties in transporting equipment and supplies to the stations. So rough was the water at Cape Wislow that loaded barges frequently had to return to the home base at Dutch Harbor without landing. Sometimes a single storm would wipe out several days of efforts to construct lighterage docks, intended for loading and unloading supplies.[81]

Once docked, construction crews built roads from sea level to mountain tops across swamps, over hills and valleys, and through mountain passes. Across rugged terrain, the engineers constructed tramways and trestles to carry supplies and equipment to the mountain sites. At Cape Prominence, a 2,400-foot tramway transported materials from the beach.[82]

Once safely on site, crews were again hampered by the vagaries of Alaska's weather and by complications due to its terrain and isolation. At Nome, Talley reported that "it will become increasingly difficult to perform useful work in the open at Nome after September 1 as at that time it again commences to get cold and soon thereafter the ground commences to freeze and all excavation will have to be accomplished by means of thawing."[83]

At Chiniak Point, Talley became disappointed with the pace of construction of the AWS station. Of all the projects under the Area Office, he complained, the AWS work remained the slowest. The AWS program was frequently modified, as new and improved radar required different locations and environments for operation and as the military situation evolved. Following the Japanese occupation of Kiska and Attu in the summer of 1942, the War Department focused its attention on the Aleutian Chain and abandoned AWS sites on Bristol Bay, Norton Sound, and in the interior. By November 1943, the construction program had become stabilized, and the only stations left to be completed were located in the lower panhandle and in the Aleutians. With plenty of manpower

at the Corps' disposal, completion of these AWS stations was wholly dependent upon the availability of equipment, material, and supplies.[84]

Constructing Civilian Aeronautics Administration (CAA) Facilities

As civilian and military use of airplanes increased during the 1930s, the airplane emerged as a principal source of transportation in Alaska. Planes could quickly cross the vast roadless regions of the interior and reach icebound ports along the Bering Sea throughout the year. Alaska's numerous lakes, bays, and harbors offered ready-made landing sites for planes equipped with pontoons, and pilots could land a plane on the frozen, level tundra in an emergency. Although military leaders did not agree on the role of air power in future military conflicts, the nation at large, and Alaskans in particular, became increasingly committed to the airplane as a routine means of transportation.

As the Army began construction of Ladd Field and Fort Richardson in 1940, the CAA was building a network of landing fields throughout Alaska. Although the CAA landing field sites were selected in anticipation of potential military use, the runways were primarily commercial facilities and as such were generally inadequate for military use, with soft-surfaces under 5,000 feet in length. Talley described the airfield at Nenana as "nothing more than a stripped area which is suitable for the landing of very small light airplanes which have large balloon tires." At Ruby, Talley noted the same condition.[85]

After the inspection of the work at Nome, Talley concluded that "the War Department is not getting what it thinks it is from this [CAA] program."[86] After reviewing additional reports estimating the completion dates for CAA airfields, he argued:

> these estimates were not all what they appeared to be on the surface to a casual reader. In other words, these estimates do not stand up in the light of military necessity in the use of the fields. ... Military aircraft requires an entirely different sort of field from that on which a small, light airplane on large doughnut or balloon tires can land. The fields which are stated as usable for aircraft of the CAA are usable for this small type of aircraft but not necessarily for military aircraft. ... Any surface in Alaska which is smooth is usable as a landing surface after the freeze-up. In this connection there are several thousand lakes in Alaska equally suitable for landing areas as CAA airfields after the freeze-up; however, when they thaw obviously you can't land a land plane on the lake nor can you land it in a morass obtained by the thawing of the airfield.[87]

Talley recommended that the Army take a firmer hand in directing the construction of the airfields.

After the United States declared war on the Axis Powers in December 1941, the military importance of the CAA airfields rapidly superseded their commercial value and the War Department determined to use those located at Juneau, Cordova, Naknek, Gulkana, Bethel, McGrath, Big Delta, Northway, Galena, and Nome. Later, the WDC authorized the construction of facilities at Tanacross and Moses Point. This work, performed under the Corps' direction, included extending the runways to meet the requirements of heavy military aircraft. The CAA airfields thus became an integral part of the Alaska defense system. The individual sites are described in more detail below.[88]

Juneau

Under the direction of Resident Engineer, Lieutenant Colonel Thomas E. Ormiston, the troops commenced construction on the Juneau staging field on March 5, 1942. The original construction program called for facilities for over 1,000 officers and enlisted men. The site, located six miles from the city of Juneau, had a number of advantages: Juneau's harbor facilities were good and power could easily be supplied by the Alaska Juneau Gold Mine. However, the site was far from ideal.

The engineers located the post in an unstable area where the water table was close to the surface. To provide a secure foundation for the buildings, they were forced to use a large amount of rock fill. The CAA-constructed airfield presented special problems. Built on the tide flats of Gastineau Channel, the 450-foot by 5,000-foot runway was built on a 10- to 14-foot-thick sand fill. The engineers constructed a dike around the runway to further protect it from erosion caused by tidal action.

For troop support, the Corps used Quonset huts and other buildings specially designed to withstand the arctic temperatures. Spread over a wide area, the camp boasted a hospital, air warning center, and a large transmitter. Personnel of the 42d Engineer Regiment and detachments of H and S Company under Lieutenant Colonel Ormiston's command, completed the work in 15 months despite unusually heavy snow and deeply frozen ground.[89]

Cordova

On March 19, 1942, Resident Engineer Major C. B. Burgoyns began work on the Cordova staging field, located 13 miles southeast of Cordova on the river flats between the Chugach Mountains and the Gulf of Alaska. The post was designed to provide housing for troops numbering nearly 1,100, and the project included the construction of repair shops and cold storage.

Other than heavy snowfall — which could reach 132 inches annually — the Corps encountered no serious construction problems at the Cordova Project. In the absence of a road from Cordova to the construction site, the Corps used the tracks of the abandoned Copper River and Northwestern Railroad to transport supplies and materials. The engineers also had access to storage space at the railroad warehouse in Cordova. The project was largely completed by June 15, 1943.[90]

Naknek, Gulkana, Bethel, and McGrath

During the summer of 1942, troops from Companies A, B, F, and E and detachments of H and S Company of 176th Engineer General Service Regiment began construction of facilities at four interior Alaska CAA airfields: Naknek, Gulkana, Bethel, and McGrath. Using Quonset huts, Cowin huts, and abandoned Civilian Conservation Corps (CCC) buildings, they quickly provided structures for housing, motor shops, hospitals, and communications facilities. Although the use of standard prefabricated buildings gave the garrisons a similar appearance, the work at each site involved different construction problems.

The first Resident Engineer, Lieutenant Colonel John M. McGreevy, began the project at the Naknek CAA airfield on July 1, 1942. Located on the Naknek River, 15 miles upstream from the village of Naknek on Bristol Bay, the site was icebound from October to May. The CAA had located and paved the 300-foot by 5,000-foot landing strips on low, rolling, sandy soil, but the area around the field was swampy, making it difficult to move materials around the site.

Transporting materials to the site posed an even greater obstacle. The shallow coast line forced ocean-going vessels to stand 14 miles off the mouth of the Naknek River, from which their cargo was transferred to barges, pulled to the mouth of the river, then towed the final 15 miles to the project site. Towing on the shallow Naknek River could be accomplished only during high tide, further complicating the delivery of goods. During the seven months when the river was frozen, all supplies, equipment, and material had to be flown in.

By September 23, 1944, troops under the command of Major Sherman B. Anderson and Major Wilford J. Boudreau had constructed facilities for nearly 1,400 officers and enlisted men, as well as motor shops, hangars, and operating facilities for the Air Corps. In addition, the troops built a 2,500-foot extension to the CAA-constructed runway.[91]

Under the command of Resident Engineer Captain Scott F. Childress, Company "F" built the Gulkana Post between July 13, 1942 and July 5, 1943. The program at Gulkana called for facilities for troops numbering nearly 500, as well as motor repair shops, a 14-bed hospital, and facilities for the Alaska Communications System.

Unlike Naknek, the Gulkana Post, located on a level plateau near the Richardson Highway 125 miles north of Valdez, was accessible by road. While a shortage of materials caused periodic delays, frigid temperatures and permafrost created the greatest problems for the construction crews. Although the surface thaws to a maximum of five feet during the summer, the subsoil of the sparsely wooded terrain remains frozen year round; both the permafrost and the process of freezing and thawing create an unstable base for foundations. The engineers were compelled to lay mudsills flat on the ground or place timber-spread footing under each foundation post at a depth of approximately three feet. The extreme cold during the winter months also brought construction to a standstill for extended periods of time.[92]

Under the successive commands of Resident Engineers Major Grady C. Fuller, Lieutenant Colonel G. D. McKay, Major Menon W. Whitsett, and Major W. J. Boudreau, troops from Company F, 176th Engineer General Service Regiment, performed similar work at the CAA airfield near Bethel. Bethel is located outside the Alaska road network, 100 miles upstream from the mouth of the Kuskokwim River — a sluggish, meandering waterway that regularly overflows its banks and deposits thick silt along its banks. To secure solid foundations, the engineers placed all buildings on posts and pilings made from timber cut in the forest 85 miles upstream and then floated down the river.

As at Naknek, transporting building materials to and around the site proved extremely difficult. Although navigable for shallow draft vessels, the Kuskokwim River is frozen between October and June. The site is flat, sparsely covered with scrub willow, alder, and spruce, and is difficult to drain. During the extended rainy season, the water table is very near the surface and much of the area lies

under water. In order to move construction equipment and building materials, the engineers built large sleds that they pulled with tractors.[93]

Upstream from Bethel on the Kuskokwim River, engineers under the direction of Lieutenant Eugene R. Ialas, began construction at the remote airfield at McGrath on July 30, 1942. The project, which took a year to complete, included the construction of housing for 200 officers and enlisted men, motor repair shops, and a hospital unit. Located in interior Alaska on the flight lines between Anchorage and Nome and between Fairbanks and Bethel, McGrath is accessible by shallow-draft river craft between May and September. During the winter, McGrath residents depended on dog sleds and airplanes for transportation. This limited accessibility and the poor condition of the on-site road network complicated the delivery of construction materials.[94]

Moses Point

Moses Point airfield, located 100 miles east of Nome on the east side of Norton Sound at the mouth of the Kwiniuk River, was developed as an emergency landing field for the Seward Peninsula. Since Moses Point is accessible only by air and by water and has a very shallow harbor, all supplies and materials for the site had to be lightered by barge from transports standing two miles off shore. In addition, before initiating construction, troops had to build a six-mile road from the landing at Iron Point to the construction site. The persistent, strong winds at Moses Point created a difficult construction environment, particularly while building shells were being completed.

Resident Engineer Captain J. P. McDermott commanded a construction crew of 33 troops from Company "B" of the 297th Infantry, comprised of men formerly in the Alaska National Guard. Although the original construction program included facilities for 98 officers and 1,100 enlisted men, motor repair shops, and a 50-bed hospital, the WDC ultimately reduced the strength and capacity of the post by roughly 90 percent — down to 12 officers and 138 enlisted men and only a six-bed hospital.[95] Quonset huts, Cowin huts and a mess hall were ready for use by November 1942, soon after work began on the project. The troops then completed their work at Moses Point after supplies and materials arrived in the spring of 1943.

Big Delta, Northway, Tanacross, Galena, and Nome

The Corps constructed five additional posts at CAA airfields between 1941 and 1943: Big Delta, Northway, Tanacross, Galena, and Nome. Although facilities and work conditions were similar to those at other installations, these sites were distinguished by their use as landing fields for the Alaska-Siberia (ALSIB) Project, through which nearly 8,000 planes were ferried to Russia under the lend-lease program.

Big Delta is located near the confluence of the Delta and the Tanana rivers, 90 miles southeast of Fairbanks. On July 15, 1942, troops of the 176th Engineer General Service Regiment, with Major Sherman B. Anderson as Resident Engineer, commenced construction at Big Delta, augmenting the two CAA-constructed runways. The original Big Delta program included facilities for troops numbering 800, motor repair shops, a 14-bed hospital, and four 25,000-gallon fuel storage tanks. As on other projects, delayed shipments of material frequently hindered the work at Big Delta. However, from a small, nearby private mill, the troops were able to purchase timbers to bridge the Tanana River. The Corps also operated its own portable sawmill to cut lumber for three warehouses and a fire station at Big Delta.

In 1943, in response to increased shipments of planes to the Soviet Union, the Air Corps authorized expanded facilities, including a third runway, at Big Delta. In August 1943, when the Big Delta program was approximately 50 percent finished, the War Department transferred the project to the Northwest Service Command for completion.[96]

The Northway Post was located on the lend-lease Air Transport Command route halfway between Fairbanks and Whitehorse. Small river boats could travel up the Tanana and Nabesna rivers from Big Delta to Northway only during the summer months after the Tanana had thawed. During the long winter, the site was accessible only by air. Frigid temperatures, as low as 60 degrees below zero Fahrenheit, further complicated construction efforts.

On July 18, 1942, a platoon of the 176th Engineer General Service Regiment, under Resident Engineer Lieutenant Donald E. Blotcky initiated construction at Northway. The program included facilities for 13 officers and 140 enlisted men, a 4-bed hospital, and an Air Corps operations building. The post was constructed on permanently frozen alluvial sand and gravel topped with muskeg. In addition

to Quonset huts shipped in from the outside, the engineers built structures with timber acquired locally and from the Corps' mill at Big Delta.

In 1943, the Northwest Service Command assumed responsibility for the completion of Northway facilities, and the engineer troops were transferred. The Northwest Service Command expanded the facilities to accommodate the increased number of planes flying the ATC route to the Soviet Union.[97]

On November 2, 1942, one platoon of Company "F" of the 176th Engineer General Service Regiment with a detachment from H and S, under the command of Captain William T. Bostick, began work at Tanacross Field as part of the ATC expansion program for ferrying planes to the Soviet Union. Located 150 miles southeast of Fairbanks in the Alaska interior, Tanacross is built on alluvial sands and gravel covered with six inches of tundra. Severe winter weather frequently closed the supply routes to the area and slowed construction. In January 1943, Bostick reported temperatures of 73 degrees below zero Fahrenheit, "to which information the Resident Engineer added that very little outside work was being accomplished."[98]

The small construction program at Tanacross included minimum facilities for two officers and 48 enlisted men and a 2-mile road from the site to the Alaska Highway. The troops erected Quonset huts throughout the camp and built 16-foot by 16-foot Stout houses for Air Corps operations buildings. The engineers completed their work at Tanacross on June 1, 1943, at which time the Northwest Service Command assumed responsibility for the field.[99]

Located on the Yukon River, 366 miles down river from the Nenana railhead and midway between Fairbanks and Nome, the airfield at Galena served as another link in the ATC ferry route to the Soviet Union. Galena was accessible only by air and by water. Those supplies arriving by water were at the mercy of the weather and of the river, which froze solid during the long winter. The two small river steamers and small barges running between Nenana and Galena between May and October frequently ran aground on the bars of the shallow river, delaying delivery of supplies and equipment.

On September 17, 1942, a platoon of Company "C" of the 176th Engineer General Service Regiment, under the command of Captain Herbert C. O'Neil, began construction of the Galena Post. The original construction program included facilities for 36 officers and over 300 enlisted men, motor repair shops, and a 12-bed hospital.

As the war escalated in June 1943, the War Department merged the original construction plan with the ATC program and expanded the post to include an extended principal runway, a second runway, and a wood truss hangar. In order to expedite the additional construction, the balance of Company "C" was transferred to Galena and the CAA contracted the construction of the second runway to the Summers Construction Company of Juneau.[100]

Located on the coast of the Seward Peninsula, 580 miles northwest of Anchorage, Nome served as an important commercial and military center during World War II. Since Nome is icebound a large part of the year and is located on the principal global air route of the north, air transportation played a significant role in the community's development. Nome also held a commanding strategic position for patrolling the Bering Sea, and, following the German invasion of Russia in 1941, was destined to become a major landing site for pilots ferrying planes to Siberia under the ALSIB Project.

The CAA began construction of two runways at Nome for commercial and military use in 1941. Under the supervision of Resident Engineer Captain John W. Baum, civilians commenced work on the associated Nome Post on July 23, 1941. The first troops arrived in September of that year.

By May 1943, the Nome fields and garrison had become inadequate for the ALSIB demands and the Army authorized expanded construction. This accelerated building program included the relocation of the Snake River (providing additional aircraft parking space), construction of a modified Birchwood hangar, the addition of a 2000-foot extension to the Moonlight Springs satellite field (located north of the main airfields), and the construction of housing for 1,000 men. With the completion of the new construction at Nome, the plane-ferrying network between Alaska and Siberia was complete.[101]

Between 1940 and 1944, the Corps contributed significantly to the establishment of Alaska's air defense facilities. The engineers completed construction of the two major air bases at Fairbanks and Anchorage. They built air bases and posts in the panhandle to defend the coastal ports against attack. Across the Alaska interior they constructed posts to support, defend, and maintain the network of CAA airfields. Often at breakneck speed, under difficult environmental conditions that tested both men and equipment, the engineers successfully built air strips on sand, tundra, and muskeg and constructed facilities to supply and support the Alaska air defense program.