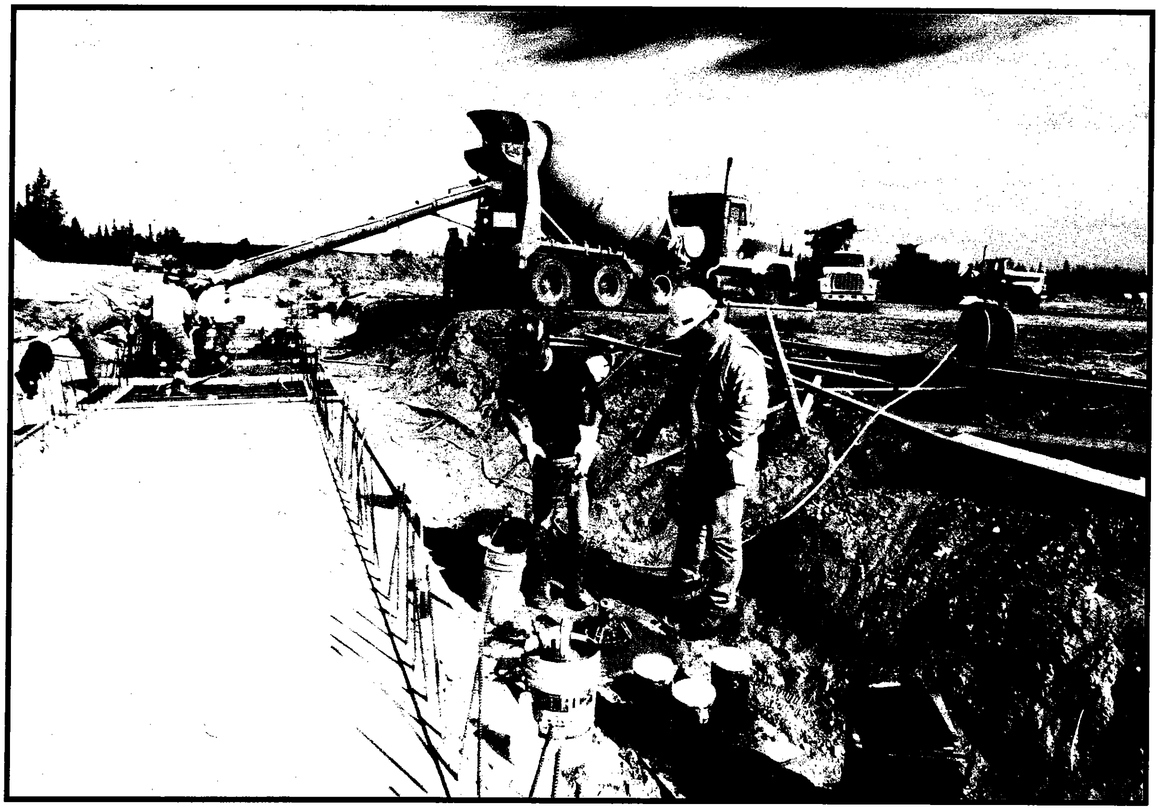


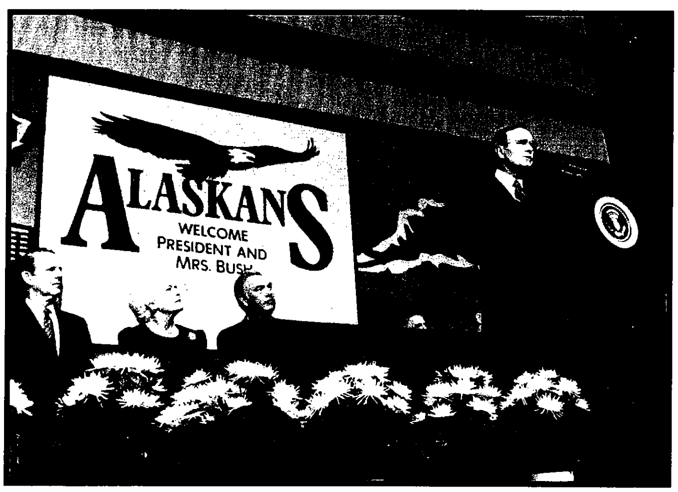
XI. MILITARY PROJECTS

GENERAL DEVELOPMENTS IN MILITARY PROJECTS DURING THE MODERN ERA

From 1975 to the early 1990s, as in earlier decades, the primary military mission of the Alaska District was nothing less than "total support" of the armed services in the state.[1] World War II had demonstrated Alaska's strategic importance. The Cold War not only ensured continuing recognition of the state's crucial location and training environment, but also increased Alaska's role in achieving stability in an era of rising global tensions. At the height of the Cold War, Alaska's proximity to the Soviet Union made an adequate defense of the state paramount. The shortness of Alaska's polar routes for quick and efficient deployment added markedly to its military significance. Thus, after World War II and throughout the Cold War, the federal government maintained a strong military presence in Alaska at Forts Richardson, Greely, and Wainwright; at Eielson and Elmendorf Air Force Bases; several other smaller air bases; and at a string of increasingly technologically sophisticated radar stations located throughout the state.[2]

The heightened recognition of Alaska's strategic role and a corresponding increase in military spending in Alaska throughout the 1980s reflected the Reagan administration's commitment to expand the United States' ability to deter Soviet aggression. The cornerstone of American foreign policy during this period was the position that without a strong military, the U.S. could not execute an effective diplomacy. As early as June 1981, Assistant Secretary for European Affairs Lawrence S. Eagleburger expressed the administration's "resolve" to strengthen the United States defense capability. This decision was largely in response to a Soviet military buildup and to the belief that, in Afghanistan and elsewhere, the Soviets were demonstrating a "growing propensity to use force as an instrument of policy."[3] By the mid-1980s, advances in Soviet cruise missile technology, the deployment of Soviet nuclear submarines in polar waters, and the movement of SS-20 nuclear missiles eastward along the trans-Siberia railroad ensured that the federal government would substantially enlarge its military presence in Alaska, which Reagan, like others, had termed the nation's "first line of defense." This augmentation entailed sharply upgrading the radar system that dotted the state's expansive terrain, improving other facilities, and stationing greater numbers of conventional forces at Alaska posts.[4]

Instrumental to the increase in military personnel was a policy decision to activate the 6th Light Infantry Division at Alaska posts.[5] Army Forces Command had conducted stationing studies after the Secretary of the Army, John Marsh, in August 1984, recommended to Defense Secretary Caspar Weinberger the activation of two new light infantry divisions. On September 11, 1984, the Army proposed that the 6th Infantry Division (Light) be temporarily headquartered at Fort Richardson, Alaska, adding to the 172d Infantry Brigade already resident there. The proposal also envisioned stationing the 6th Infantry Division (Light) at Fort Wainwright, which was projected as the division's eventual headquarters. Designating these Alaskan locations reflected the goal of strengthening armed forces on the west coast.[6] More



Presidential Visits

President Ronald Reagan arrived in 1983 and President George Bush spoke at Elmendorf Air Force Base in 1989.

specifically, however, Army Secretary Marsh chose to activate the 6th Infantry Division (Light) at the Alaska posts precisely because of Alaska's northern "unique training environment" and the shortness of the Alaska division's polar routes for deployment purposes.[7]

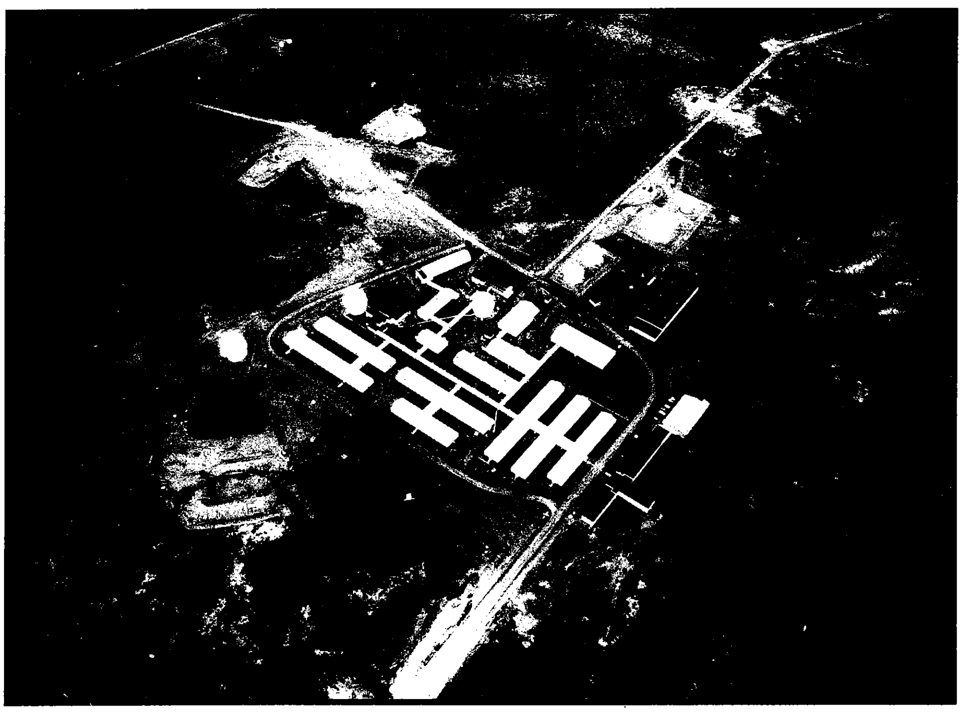
By the mid-1980s, 10,000 additional servicemen and women had arrived in the Far North. Not all Alaskan residents, however, welcomed this influx of military personnel. Local objections included fear of increased job competition, and of reductions in fish and game populations for hunting and fishing. Local residents also anticipated expanded needs for social services and impacts on school systems as a result of the influx. In response, an editorial from *The Anchorage Times* offered a preview of the Secretary of the Army's reasoning: "From both strategic and tactical considerations, Alaska's geographic location makes it an ideal spot to quarter troops that might have to be dispatched quickly to Asia, Europe or the Far East." The editorial continued, "Alaska offers some of the best training ground in the world, with both the climate and the elbow room the military needs to do the job."[8]

In 1987, Major General Johnny H. Corns, commander at Fort Richardson, explained more particularly Alaska's advantages as a training ground. Corns, who arrived with the 6th Infantry Division (Light), believed that Alaska's harsh weather and the "inherent danger in [Alaska's] environment" created for soldiers training within its borders a "learning edge" and a deep respect for the power of an Alaskan winter.[9]

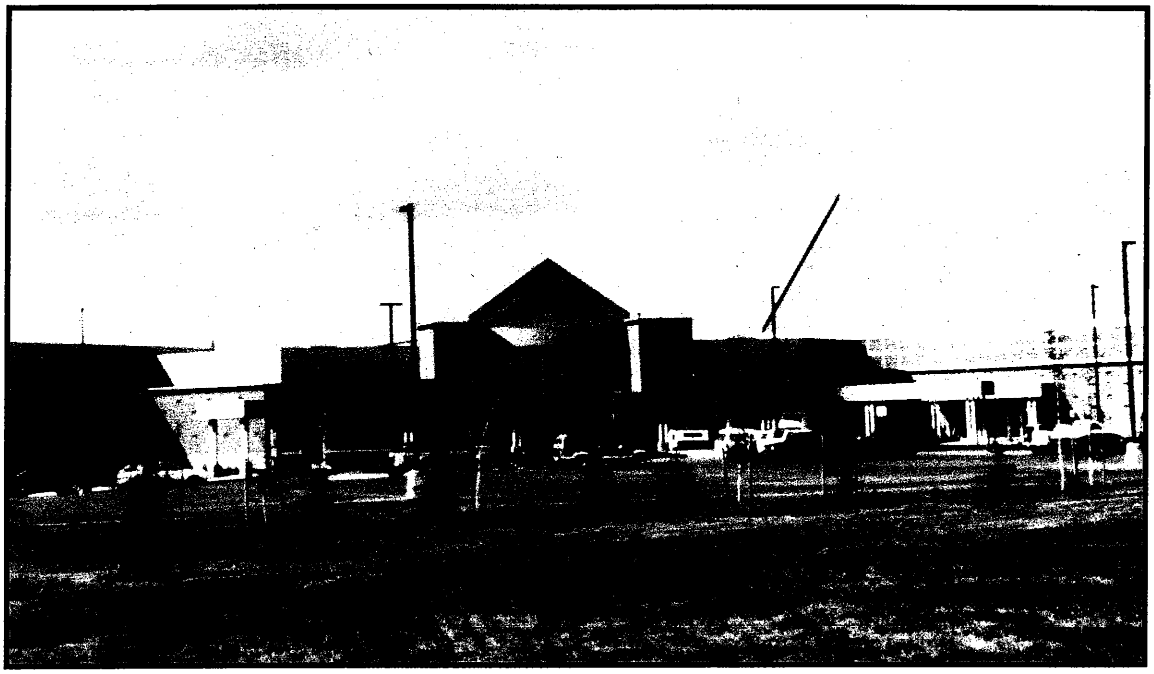
As early as 1981, the *Anchorage Daily News* reported that the U.S. Senate had targeted $70 million for military bases in Alaska. This amount was slated to cover the first phase of construction of a MARS (Minimally Attended Radar System) in the state; airport construction at King Salmon; additional construction, including housing, at Elmendorf and Eielson Air Force Bases; construction projects at Adak Naval Air Station; and the installation of vehicle exhaust systems at Forts Greely and Wainwright.[10]

By fiscal year 1986, the amount budgeted for military construction work in Alaska had increased to $120 million. The Alaska District carried the responsibility of planning, designing, and managing construction of these military construction projects. Bruce Batten, a Corps public affairs officer, remembered that the "last period of intense public works activity" had occurred during the 1950s, when early Cold War tensions had sparked the building of military bases

Senator Ted Stevens breaks ground for the Corps' largest construction project in 1980 — the Regional Operations Control Center for the Alaskan Air Command. Observing are (left to right) Joe Russell, manager, and Ed Young, president, of Interstate Co., Inc., the contracting company ; Lt. Gen. Winfield W. Scott, Jr., Commander, Alaskan Air Command; and Col. Lee R. Nunn, District Engineer.



Aerial view of Eielson Air Force Base, 1980s.



Ft. Wainwright physical fitness center.

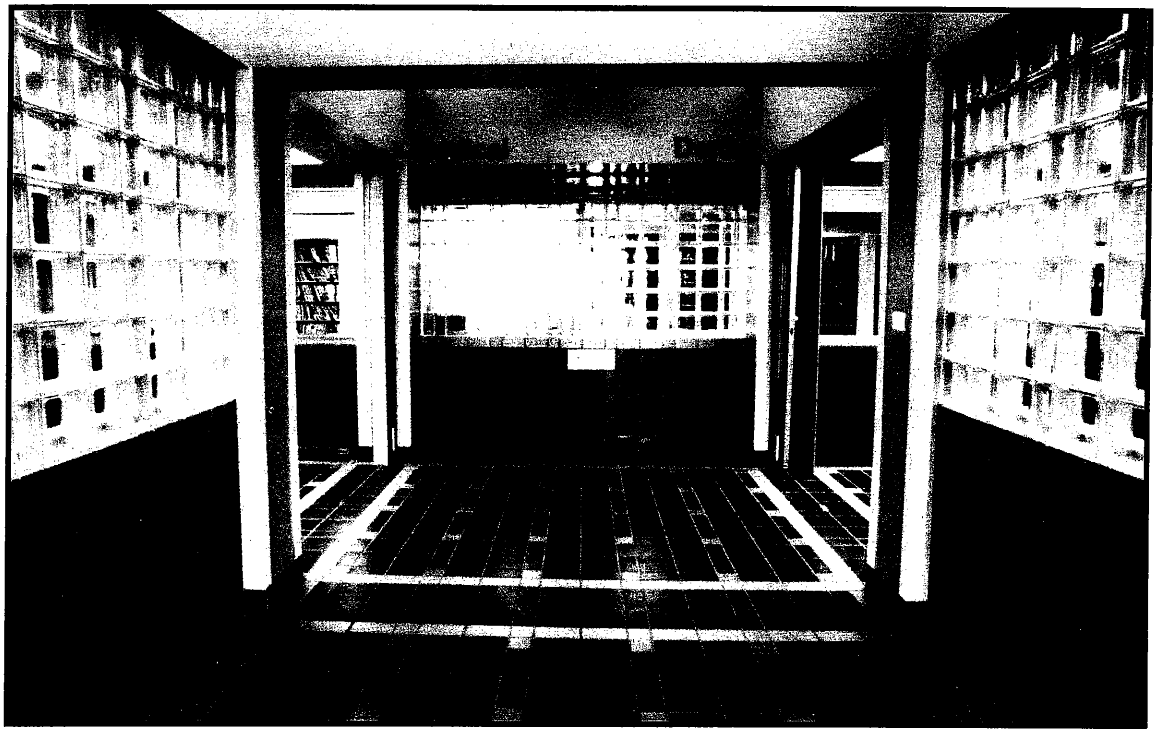
Main runway, Eielson Air Force Base, December, 1983.

in Alaska and the development of the initial early-warning radar system (Distant Early Warning, or DEWline). Batten recognized that the military facilities in Alaska were at the end of a 30-year cycle and in need of modernization. Colonel Wilbur T. Gregory, Jr., Alaska District Engineer, observed that "the Corps is administering the largest actual-dollar military construction program since World War II."[11] These defense funds, spent directly on military construction and for other military purposes, continued to have a ripple effect on the state's economy. Estimates of the total economic impact of military spending in Alaska in 1986 reached as high as $2.1 billion.[12]

In December 1987, President Reagan signed legislation that authorized even higher figures for defense spending in Alaska. This amount — more than $350 million — was allocated for housing and other types of support for the 6th Infantry Division (Light); improvements of naval facilities at Adak Naval Air Station; several Air Force construction projects throughout the state; a medical and dental clinic at Fort Wainwright; construction jobs for the Army National Guard and for the Air Force National Guard; and initial work on the Over-the-Horizon Backscatter radar system.[13]

In planning and developing all of these military construction projects, the Alaska District had to consider and overcome problems endemic to the environment of the Far North. Permafrost, extreme temperature and wind conditions, logistical supply complications due to vast distances and isolated military stations, higher construction costs, the short duration of the building season, effects of the Northern Lights on computer systems, and efforts to protect wildlife all influenced project design and implementation. Additionally, the timing of this expansion of military activity in Alaska coincided with changes in American armed forces that recognized the need for improved, family-oriented housing and support facilities.[14] In Alaska, these developments meant utilizing design features that maximized solar exposure, ameliorated the effects of long hours spent indoors during dark Alaskan winters, and implemented new advances in energy-efficient technology.

One of the earliest projects during the modern period that reflected the Corps' ability to respond to unique Alaskan conditions was the 200-man barracks built at Fort Greely's Northern Warfare Training Center in 1976. The exterior of this three-story structure consisted of ferro-cement, a tough, stucco-like substance requiring little maintenance. Design components also included a complete vapor barrier from the roof to the basement that extended below the ground's surface.



Ft. Wainwright's Medical and Dental Clinic.

Elmendorf Air Freight terminal.

A thermal break separated the building's outer shell from its interior. Additionally, the triple-glazed, thermal-break windows were designed and specially manufactured to enable surfaces to remain frost-free at 75 degrees below zero.[15] Throughout the 1980s, other military construction projects similarly evidenced the Corps' commitment to support the military needs of the nation while addressing the particular characteristics of Alaska's environment.

MINIMALLY ATTENDED RADAR SYSTEM (MARS)

Surveillance had long been one of the primary military objectives in Alaska. When policy decisions and changes in radar technology resulted in the construction of MAR stations at remote locations throughout the state, the Corps developed design criteria and supervised construction projects that responded to Alaska's distinctive environmental conditions.

A study to determine future options for the air defense system in Alaska was conducted in 1974 at the request of General John D. Ryan, then Air Force Chief of Staff. Based on conclusions from this study (known as "Saber Yukon"), Alaskan Air Command proposed that Alaska become part of the Joint Surveillance System/Region Operations Control Center (JSS/ROCC) program then being developed to replace the existing air defense system in the continental United States. The plan to involve Alaska in the JSS/ROCC program entailed modernization of radar capabilities at Elmendorf Air Force Base — where the ROCC would operate as part of a network of eight surveillance systems in the Lower 48, Hawaii, and Canada — as well as construction of MAR sites. Radar operations at the Control Center were fully automated, receiving and displaying radar information transmitted from widely scattered, remote stations. MAR site maintenance itself now required the work of only 10-20 technicians, rather than the 80-100 previously stationed at a radar site.[16]

On August 9, 1982, the Alaska District awarded a $36.3-million contract to Morrison-Knudsen Company — the District's largest contract of 1982 — to build twin-domed MAR support facilities at four Alaskan sites. Completed by 1984 and located at Indian Mountain, Tatalina, Sparrevohn, and Cape Romanzof, these twin-domed structures housed and supported the limited number of technicians needed to maintain the increasingly sophisticated radar facilities.[17]

Radar dome design wins Defense award

by Pat Richardson

Twin domes designed to house the Air Force's minimally attended radar equipment and support facilities at four remote sites received a Department of Defense engineering and industrial design award during a ceremony at the Pentagon July 9.

The concept design was submitted by Maynard and Partch, an Anchorage architectural firm, and the Alaska District developed the design. Larson Loendorf, a Seattle-area firm, did the interior design. The project was part of the Air Force's plan to modernize radar equipment and consolidate support facilities. Technological advances automating radar equipment meant that the number of personnel could be reduced from approximately 80 to about 15 at each site.

The district's project criteria at Indian Mountain, Tatalina, Sparrevohn and Cape Romanzof was to design permanent, self-contained shelter for the new generation radar equipment, vehicles and supplies, and to provide living space for the personnel.

Harsh temperatures and winds combined with the inaccessibility of the sites meant that construction materials had to be strong, relatively small, light units that could be quickly assembled on site.

The designers' solution was two round drum structures connected by a bridge at the second floor. The upper floor was enclosed with aluminum industrial geodesic domes.

The Department of Defense noted that, "The use of domes provides an economic controlled environment for both people and equipment. The creative use of lighting, materials, and colors recognizes the special needs imposed by isolation."

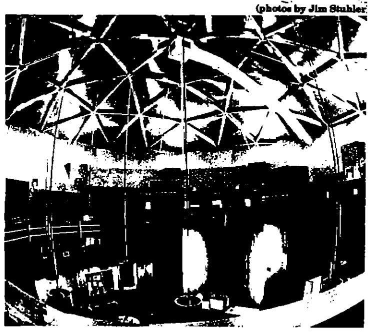
The judges commented, "A unique design solution combining human and technical engineering."

The awards were presented by Deputy Secretary of Defense William Howard Taft IV. Attending the ceremonies were Col. Neil Saling, deputy division engineer and former Alaska district engineer; Ken Wichorek, chief of project management, Air Force section; Kenneth Maynard of Maynard and Partch; and William Hanson, chief of the directorate of engineering, headquarters Alaskan Air Command.

The biennial award program is open to all military, reserve, national guard and other Defense Department construction projects, provided one of the military departments acts as a design agent.

Two other Alaskan projects won awards. One was a Navy project, while operations and training facility at Kulis Air National Guard in Anchorage took the highest award, the Blue Seal. The project design firm was Kumin Associates, Inc. The design agencies were the property and fiscal office of the Alaska National Guard and the Alaska District. Ed Waszkiewicz, project manager, Air Force section, developed the concept for the design.

(photos by Jim Stahler)



Power tunnel contract awarded

by Pat Richardson

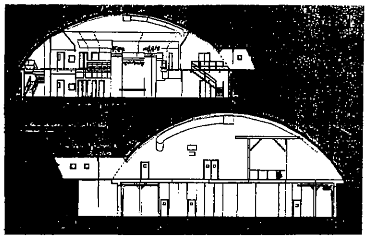
A contract for the main construction work on Snettisham hydroelectric project's Crater Lake phase has been awarded to Grizzly Construction Inc., of Bellevue, Wash., for $22.3 million.

The contract includes completing the power tunnel, tapping the lake, installing the turbine, and adding a machine shop to the existing underground powerhouse. The contractor has two years and three months to complete the work.

Last year a $5.5 million contract to excavate 6,772 feet of underground tunnel was completed.

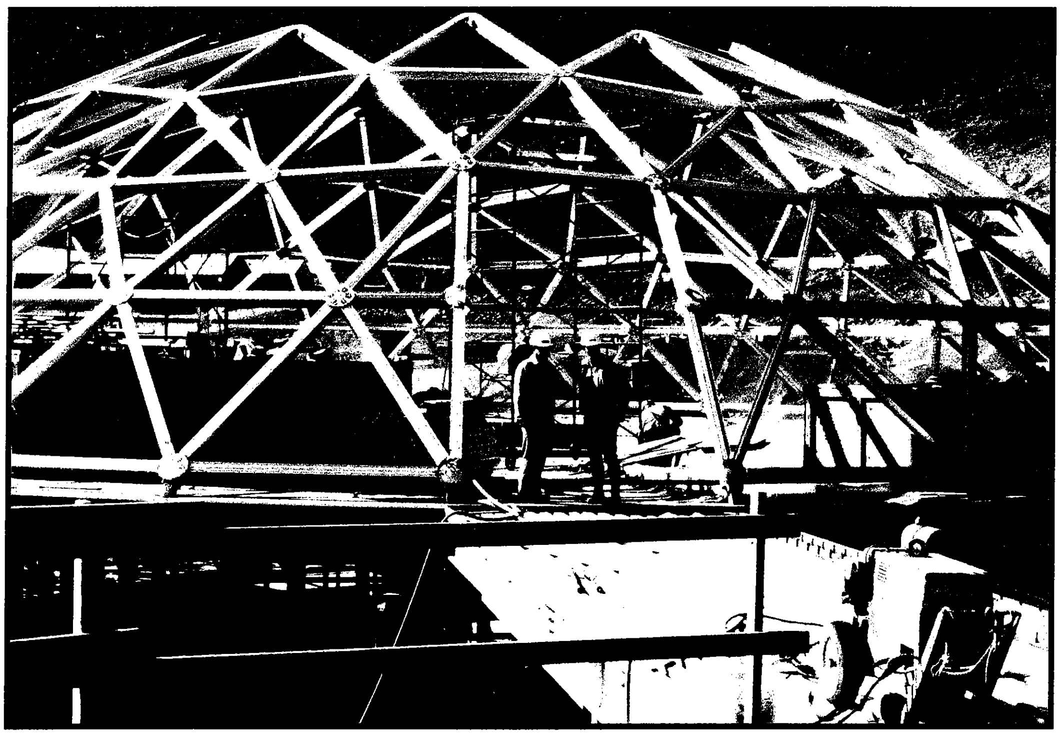
Three supply contracts for equipment were awarded recently by the Corps for the project. Federal Pacific Electric of Milpitas, Calif., received a $15,050 contract on June 30 to supply the transformer. Conte Glancz Industries Inc., of Paramount, Calif., received a $178,570 contract on April 18 to supply and assemble switchgear. Woodard Governor, of Rockford, Ill., received a $219,508 contract to supply a governor.

Two supply contracts are pending to supply a generator and supervisory controls for the project located near Juneau.



MARS

Minimally Attended Radar System



Construction began at Indian Mountain and Sparrevohn in late August. To offset the effects of permafrost on the foundation, contractors used thermal probes to classify and place screened material in excavations. Only air transportation could deliver supplies to these extremely remote locations, situated 350 air-miles north and 185 air-miles west of Anchorage, respectively. Short gravel runways limited the size of the aircraft transporting personnel, supplies, and equipment to the construction sites. Continuing access depended acutely on weather conditions. The first phase of construction work at Indian Mountain was finished by October, but storms early that month shut down operations at Sparrevohn until work resumed at both sites in April 1983.[18]

In addition to air transports, sea-going barges brought supplies and personnel to Cape Romanzof, located on the Bering Sea approximately 530 air-miles west of Anchorage; river barges supplied Tatalina, situated 230 air-miles northwest of Anchorage. By January 1984, more than 5,000 tons of materials and equipment had been transported to the four MAR sites.[19]

The Corps' project criteria for the Indian Mountain, Tatalina, Sparrevohn, and Cape Romanzof structures included provisions for self-contained, permanent shelters for upgraded radar equipment, vehicles, and supplies, and living space that would mitigate the effects of long winters, harsh weather conditions, and extreme isolation. The result of the designers' efforts produced twin, two-story geodesic domes, connected by a bridge on the second floor. The larger of the two domes housed all of the maintenance equipment. The designers determined that by separating the living quarters from the maintenance facility they could provide insulation from noise and also offer greater fire protection.[20]

Boyd Lowendorf, a Seattle interior designer, planned the residential dome's interior lay-out and chose the finishes and lighting system. Lowendorf commented that in designing the interior he had attempted to make the domes "as human and supportive as possible."[21] In the 90-foot-diameter residential dome, the project plan included private sleeping rooms with built-in furniture bordering a large, spacious atrium. Skylights rimmed the top of the dome. The sleeping rooms each had an outside window as well as a full-length, fixed-glass sidelight adjacent to a door that looked into the atrium. Vines and other plants draped the second-floor balconies. The lighting could be controlled to simulate gradual changes in natural light throughout the day. The upper level also provided study areas. To create a feeling of both shelter and openness, the atrium walls were painted in horizontal bands of shades of tan, from a medium-dark at the floor to off-white below the junction of the walls and the underside of the dome.[22]

For some of the technicians and workers at the MAR stations, these design features were ancillary to their primary motive for signing on for this type of employment — high wages. For example, one civil engineer, Ray Bradley, stationed at Indian Mountain, explained "The pay is excellent, that's why I'm here." Other employees approached the transition from living in a "catacomb-like barracks" to the new dome housing with some reluctance. Rose Ann Shoemaker, a cook at Indian Mountain, was unsure she would like the dome's spaciousness and feared "There won't be anywhere to get away."[23] Shoemaker's hesitancy may have reflected a reaction to the dome's unconventional interior as well as her concern for privacy at the remote Indian Mountain station.

Exterior design considerations included accounting for the effects of permafrost and providing sufficient insulation to withstand temperatures of 50 degrees below zero. The entire cavity of the exterior walls was filled with mineral fiber batt insulation; the domes themselves were aluminum frames with factory-fabricated panels consisting of six inches of polyurethane foam, formed between and adhering to two sheets of aluminum. In addition to these design features, all components for the Indian Mountain and Sparrevohn locations had to be sized for transport in aircraft capable of landing on the short runways at the sites.

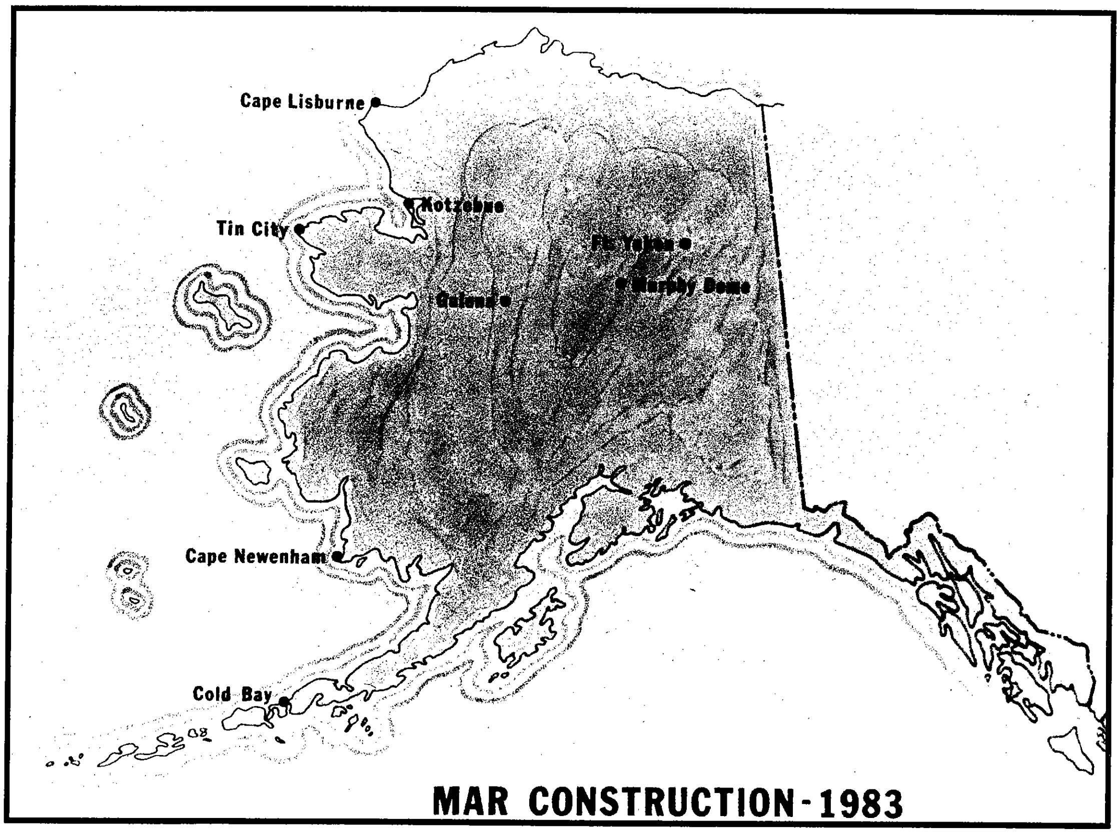
Each dome complex was furnished with a 600-kW automatic diesel-powered generating plant with waste building heat. To ensure reliability and consistency, the designers installed back-up utility systems at each site. The project plan also provided the twin-dome structures with a 60,000-gallon water tank with pumps to supply sprinkler and water transfer systems; base storage for a year's supply of nonperishable goods; and heated storage and maintenance space for vehicles. Designers determined where to place vehicle doors in the industrial dome by studying the prevailing wind and snowdrift patterns that varied from site to site.

Unpredictable and severe weather at these remote sites also necessitated alterations at the nearby radar "top camp," separate from the twin-domes. These improvements entailed providing electrically operated, emergency living quarters for stranded technicians while they waited out a storm.

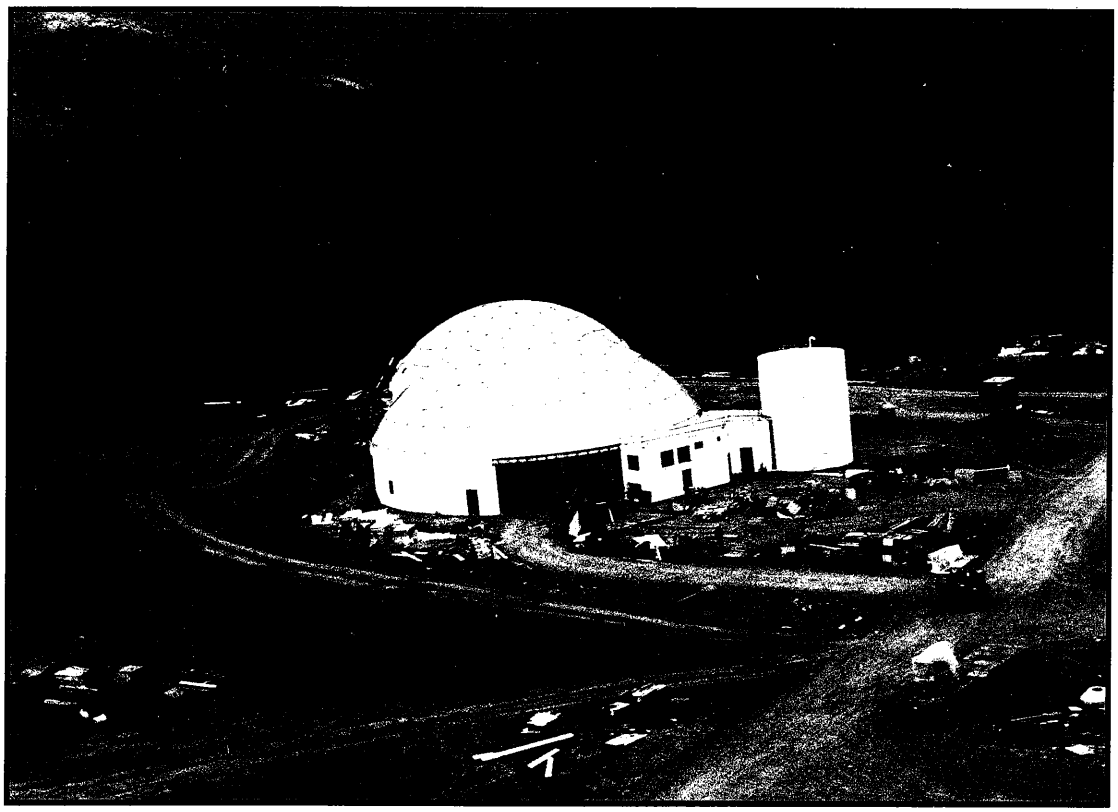
On July 9, 1986, at an award ceremony at the Pentagon, the twin geodesic domes designed for the four remote Alaskan MAR sites received a Department of Defense engineering and industrial design award. Colonel Neil Saling, Deputy Division Engineer and former Alaska District Engineer, along with Ken Wichorek, Chief of Project Management, Air Force section, attended the ceremonies. Judges praised the structures as a "unique design solution combining human and technological engineering." Furthermore, the Defense Department applauded the twin-dome design for its "creative use of lighting, materials, and colors" that recognized the "special needs imposed by isolation."[24]

Designers for the four remote Alaskan MAR stations sought to create comfortable, safe, and humane living conditions in a landscape that had none of these qualities. The geodesic domes, however, were not without problems. Panels expanded and contracted owing to temperature fluctuations. Those who actually resided in the domes complained about some of the design features, such as too few windows, suggesting that the theory and the reality of living at one of the MAR stations differed sharply from one another.[25]

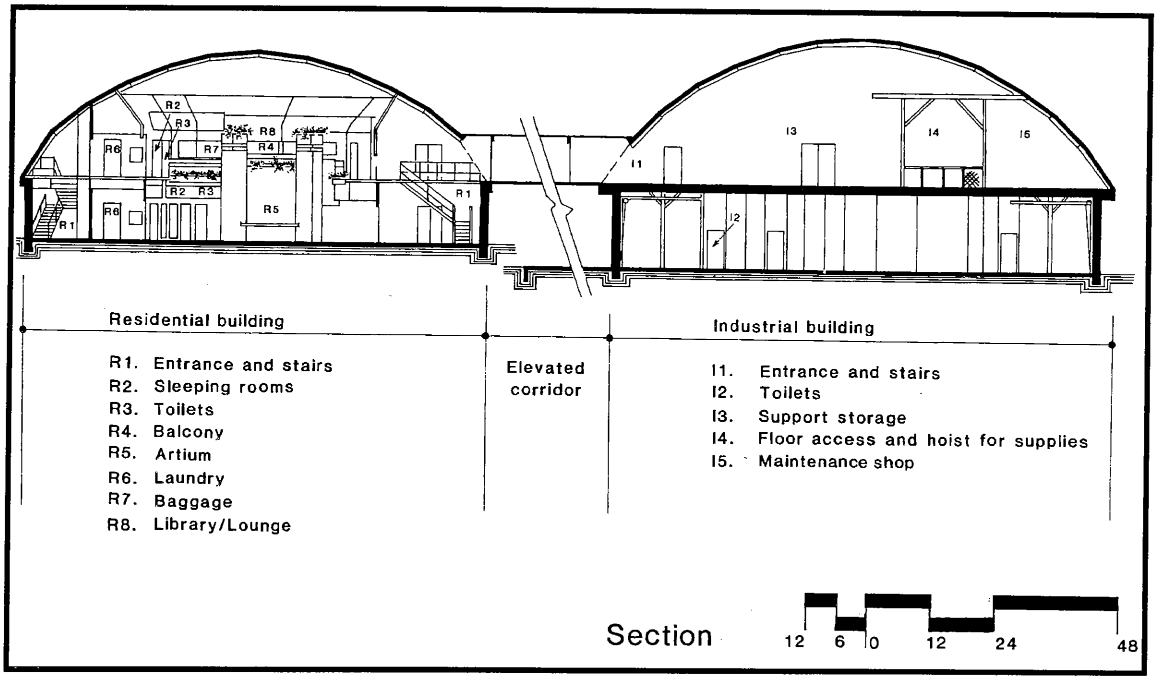
Designers had nonetheless tried to accommodate the stations' remoteness, inaccessibility, and volatile weather conditions so that personnel could live comfortably where these radar installations, vital to United States security, were located. Many of these same problems characterized conditions at Shemya Air Force Base (now Eareckson Air Station), itself equally crucial to United States defense strategies.



Model of MAR domes. Major Michael R. Foster, Acting Alaska District Engineer (pictured right), joins Larry R. Barnes from the Morrison-Knudsen Company and Colonel Ralph L. Hodge, representing the U.S. Air Force Alaskan Air Command, which sponsored the project. Also pictured is William R. Hanson, Director for Engineering and Environmental Planning.

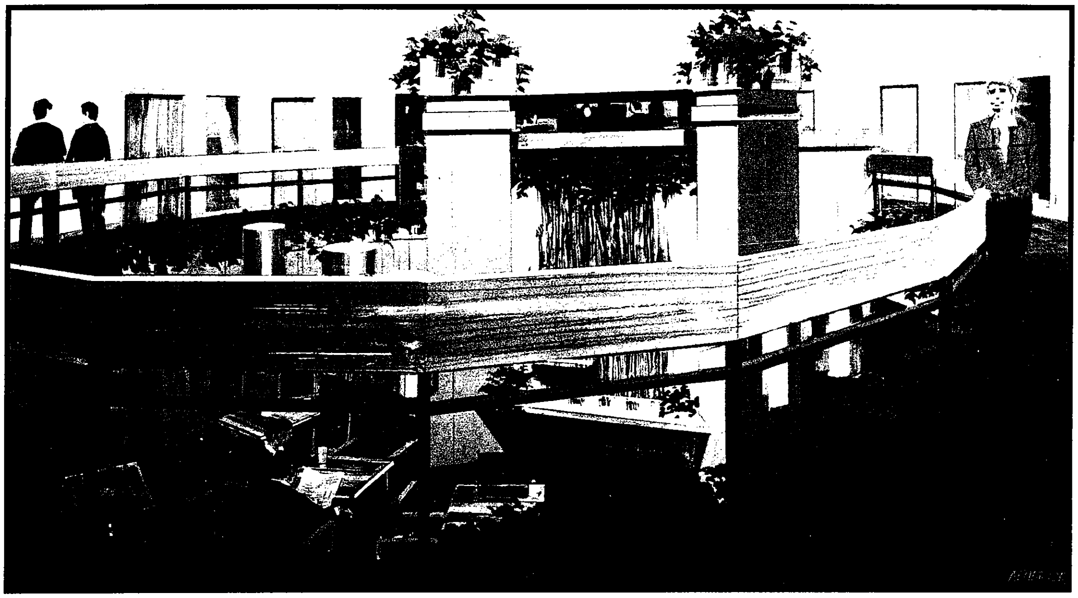


MAR dome, under construction.

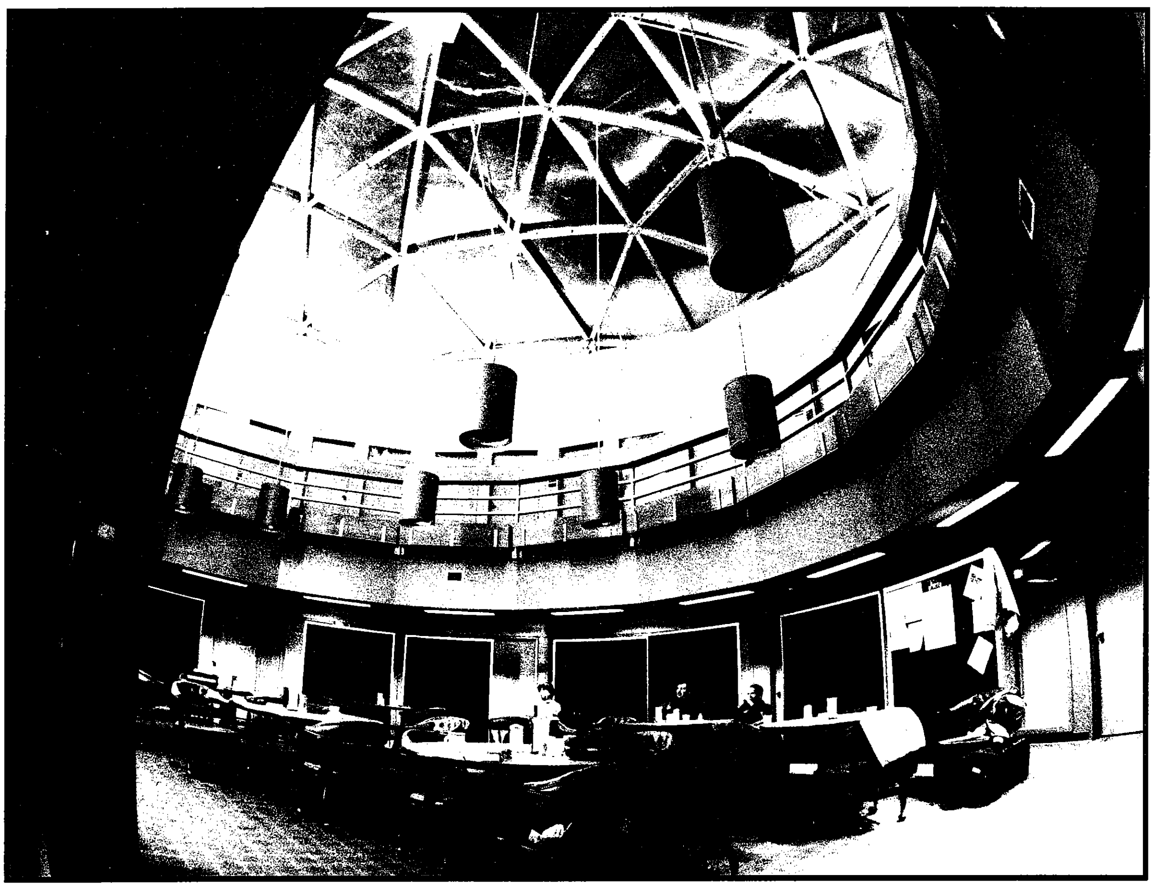


Schematic cross-section of MARS buildings.

Artist's depiction of dome interior.



Artist's depiction of dome interior.



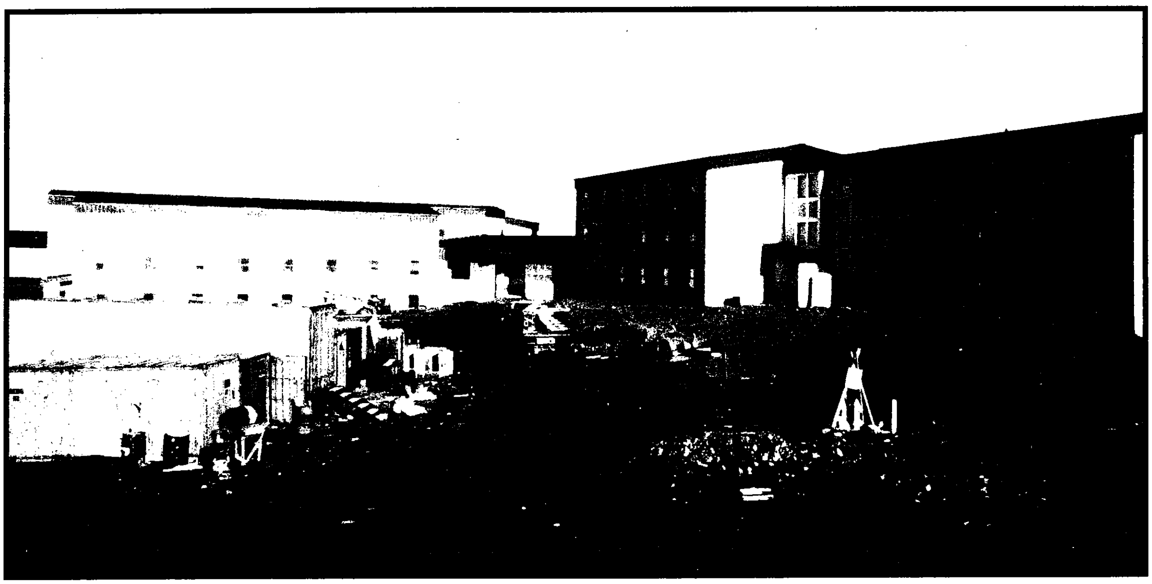
Interior of dome structure.

SHEMYA AIR FORCE BASE

Shemya Island, also known as "the Rock" and "the Black Pearl of the Aleutians" because of its black, volcanic sand, lies approximately 1,500 air-miles from Anchorage, near the tip of the Aleutian Chain. The island is approximately 11 miles square; larger aircraft cannot land on its relatively short airstrip. Winds at Shemya consistently blow at 20 miles per hour and frequently gust up to 130-140 miles per hour. Because the island is surrounded by saltwater, these winds are highly corrosive. Shemya Island is often fogbound or overcast, and the sky is completely clear only five days a year.[26] These extreme conditions of isolation, lack of natural resources, strong corrosive winds, frequent fog, and a short runway combine to influence design decisions and to complicate construction at Shemya.

Shemya Island is also situated 450 miles from the Kamchatka Peninsula, in what was the far eastern U.S.S.R. Since the 1960s, the air base located on this rocky, remote, barren island has monitored Soviet missile tests. During the 1970s, new developments in radar technology, such as "Cobra Dane" at Shemya, brought within range of the base's surveillance capability the impact points from test missiles fired from Plesetsk or Tyuratam Soviet bases. Thus, Shemya has long been a vital component in United States air defense systems.[27]

In 1984 the House Armed Services Committee approved an Army request for $12.8 million to begin construction of a rocket-launching base at Shemya. This request reflected the Army's response to increased Soviet military movements in



Shemya, October, 1989.

and around eastern Russia, the need to verify arms control agreements, and changes in American defense strategy. These developments served to heighten Alaska's strategic significance.[28]

The rocket-launching base consisted of launch pads, missile storage and assembly buildings, and radar sites. The sounding rockets to be launched from the site were designed to carry instruments as far as the edge of the earth's atmosphere in order to monitor Soviet nuclear warhead tests. This type of radar system was a corollary development in the Army's efforts to develop weapons capable of destroying enemy nuclear missiles in flight.[29]

In 1986 at Shemya, construction projects included building a 43,400-square-foot composite structure that would house 111 officers, as well as enlisted personnel or contractors who were permanently stationed at Shemya. This project included plans for three crew kitchens with dining areas, a recreational or study area, and a connecting passageway to a previously built hangar.[30] In 1987, construction work at Shemya added to the Alaska District's extremely heavy workload of that year. This $10-million project increased diesel storage at the base. Two years later, Congress allocated another $23.7 million to build a cold storage and subsistence warehouse, communications and fuel operations facilities, as well as to improve existing fuel and water systems on the island.[31]

In addition to these two projects, work began in July 1988 on a third construction job that entailed building an 85,000-square-foot, three-level dormitory for enlisted personnel and a 38,000-square-foot aircraft maintenance hangar. In designing these projects on Shemya Island, the Alaska District had to overcome volatile weather, a short outside construction season, and supply problems. All heavy equipment, including concrete batching equipment, tools and materials were first assembled in Seattle and then shipped to Shemya on barges. As one observer in the Alaska District summarized, "Few project sites are as tough as Shemya."[32]

BACKSCATTER AIR DEFENSE RADAR SYSTEM

Significant construction problems also plagued the building of a Backscatter radar system in Alaska. In 1989 Congress appropriated $145 million for site preparation and initial construction of a Backscatter system in Alaska; Congress also planned to allocate another $209 million to complete the system, which operates by bouncing signals off the ionosphere around the curvature of the earth. These Over-The-Horizon signals can detect airplanes or missiles at all altitudes at a range of 1,800 miles, thus vastly exceeding the 200-mile range characteristic of radar capacity in the DEWline.[33]

Construction of the Backscatter system, however, was prolonged and resulted in cost overruns of at least an additional $150 million. Many of the problems stemmed from Air Force administrators' lack of knowledge about Alaskan conditions. Based in Massachusetts, these administrators did not account for the effects of permafrost in construction design and cost estimates. The proposed system consisted of two mile-long wire-fence transmitters, ranging in height from 35 to 135 feet, to be located near Gulkana, and a pair of two-mile-long receivers west of Tok. The wire-fence transmitters, each with large reflective wire groundscreens, would have disturbed the vegetation that insulates the permafrost, which would have caused ground subsidence. Choices for correcting this oversight were either to refrigerate the permafrost or to place portions of the transmitters on insulated and cooled pedestals.[34]

Other relatively costly design alterations, reflective of uniquely Alaskan conditions, increased the total expense of developing the Backscatter system in Alaska. These included over $20 million to redesign the antennas so that the high wire fences contained eight-foot gaps, wide enough to allow migrating swans and other birds to fly through with less frequent collisions. Also, in addition to paying $20 to $30 million for new computer software and support services, $10 million was required to upgrade the computer systems in order to filter out the effects of the aurora borealis.[35]

In late January 1990, the Corps authorized the placement of fill to begin construction of the Backscatter system near Gulkana and Tok. The project comprised installing antennas and groundscreen, and constructing an associated building, necessary access and perimeter roads, a wastewater lagoon, and a power plant. Construction on this project stopped in the early 1990s, in part due to the collapse of the Soviet Union.[36]

Developing the Backscatter system, as well as improving facilities at MAR stations and Shemya Island, reflected the federal government's recognition of Alaska's increased strategic significance throughout the 1980s. When facility upgrades included providing housing for personnel, these projects also incorporated new concerns for creating comfortable and supportive living quarters. Both the recognition of Alaska's military importance and changing concepts in military housing are demonstrated in improvements at King Salmon.

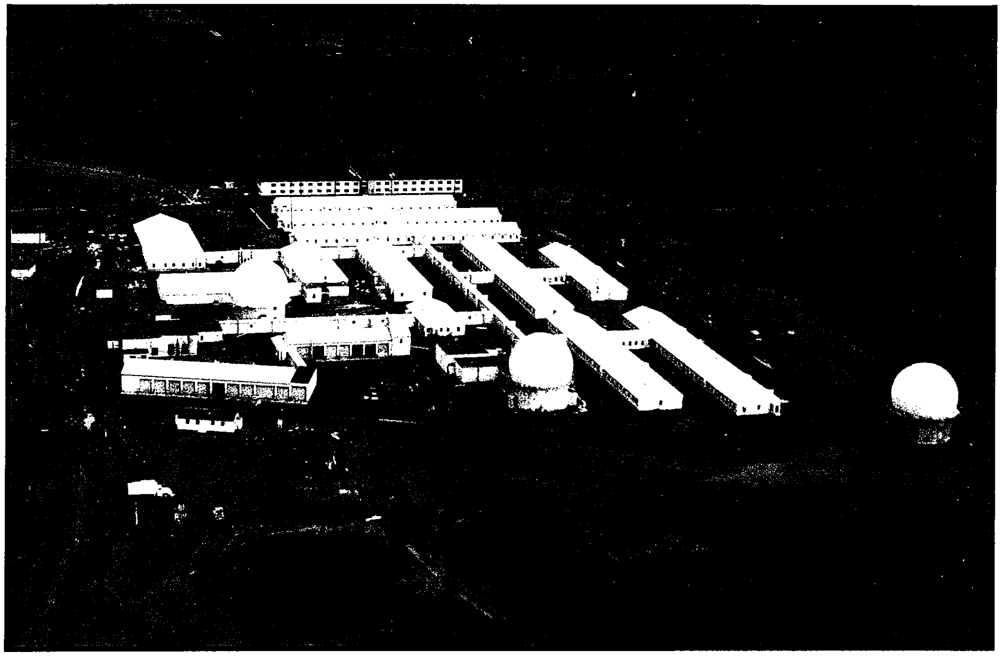
IMPROVEMENTS AT KING SALMON

Facilities at King Salmon, located on the wind-whipped Alaska Peninsula, were built in 1955 and 1956 for the Air Force by the Alaska District and Western Electric Company. This tropo station ("tropo" is short for forward propagation tropospheric scatter) was part of the original White Alice Communications System (WACS), and began operating in May 1957. During Alaska Air Command's project Stretchout, King Salmon became the link between the Aleutian DEWline and the main WACS network.[37]

Early improvements at King Salmon included construction of two Air Force dormitories during the summer of 1976. By this time, functions at King Salmon included serving the 5071st Air Base Squadron and the 705th Aircraft Control and Warning Squadron. The project envisioned two steel-framed, two-story buildings that would house nearly 400 individuals. Among the features that added to the comfort of the dormitories were a central hot water system, a master television antenna and an automatic fire-detection and alarm system. The Corps ensured that the design of these dormitories reflected the "policy of giving the modern Air Force improved living and working conditions."[38]

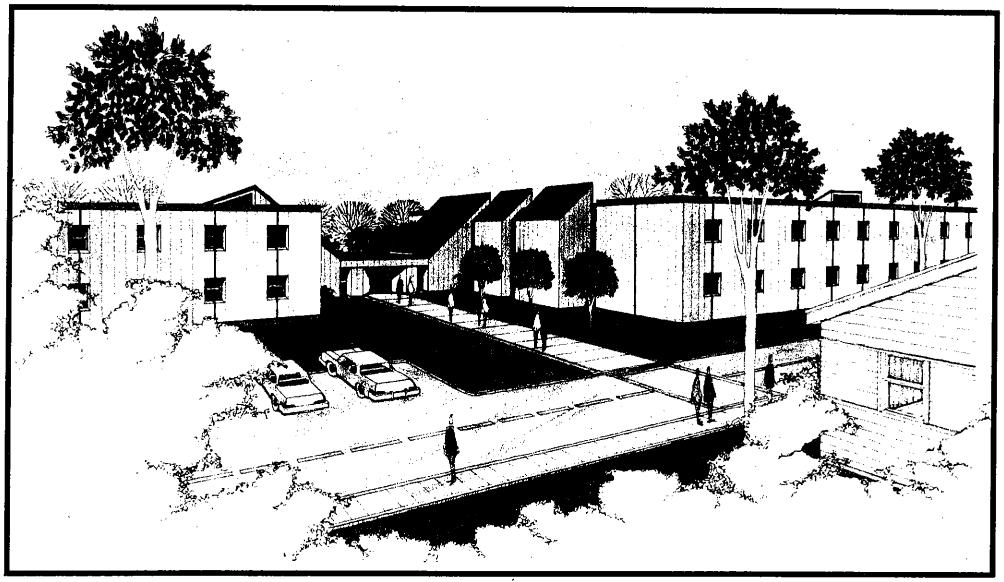
In March 1982, the Corps sought bids to construct a new composite building that would replace the "Korean War-vintage facilities" at King Salmon. In May of that year, the Corps awarded a contract to two construction firms in a joint venture for $4.1 million. This first "mini-mall" for the military in Alaska, completed by December 1983, contained a base exchange, theater, library, barber shop, package store, dining hall, clubroom with a dance floor, and a central mall decorated with plants. The composite building was constructed to match the adjacent barracks. Describing the project, District Engineer Neil Saling remarked that the new facility was a "quantum improvement in the quality of life at this remote station."[39]

Reactions to housing developments at Fort Wainwright, in support of the recently activated 6th Infantry Division (Light), echoed Saling's assessment concerning the quality of life. Through participation in the Army's 801 Housing Program, the Corps contracted with designers and builders to meet the goal of providing increased housing that was comfortable, family-oriented, and environmentally responsive.



King Salmon, located on the Alaska Peninsula.

New Air Force dormitories at King Salmon.



Artist's rendition of King Salmon facilities.

King Salmon's composite facility mall.

801 HOUSING

As of 1974, demand for both on- and off-post housing at Alaska's Fort Wainwright frequently exceeded supply. Military personnel with families were advised to arrive in Fairbanks alone, as the struggle to find housing often created hardships for families. Off-post housing was generally more expensive and of lesser quality than comparable housing in the Lower 48. Enlisted men without families could find housing in troop billets; officers and noncommissioned officers were provided with on-post bachelor quarters.[40]

Pre-801 housing at Fort Wainwright, circa 1976.

By 1986, full deployment of the 6th Infantry Division (Light) awaited the construction of a 400-unit 801 housing project at Fort Wainwright. Activation of the division meant that 4,100 additional troops and their families would need housing at Forts Richardson and Wainwright by September 1987. Military construction and housing, principally at Fort Wainwright, accounted for $631 million of the total $1 billion estimated for installation of the full division at the Alaska posts between fiscal years 1985-1992.[41] The Corps selected North Star Alaska Housing Corporation of Fairbanks to design, construct, and lease to the government this initial phase of the housing development at Fort Wainwright.[42]

On June 27, 1986, District Engineer Wilbur Gregory and North Star Alaska Housing Vice-President Richard W. Fischer signed two lease agreements. In the first of these, the federal government leased a site at Fort Wainwright to North Star for 32 years; the developer in return agreed to build the 400-unit on-post housing complex. By terms of the second agreement, the government promised to lease the buildings from North Star for 19 and one-half years; the first year's rent was set at $7.7 million.[43]

The 801 program is a build-to-lease family-housing program in which the military enters into long-term contracts with a project's developer, who in turn finances, constructs, and usually maintains and continues to own the housing. The program was meant to extend the federal government's payment schedule and to avoid immediately adding significantly to the defense budget. In addition, the 801 program also helped the military meet its goal of improving family housing. Explaining the emphasis on providing family-oriented housing, Army Chief of Staff General John A. Wickham, Jr., remarked that "... unit readiness is inextricably tied to soldiers' morale and discipline and to sustaining their families' strength." Wickham continued, "The better we can make soldiers and their families feel about the Army and the support provided by the Army, the better off the soldier, Army and nation will be."[44]

From the onset, designers for 801 housing projects at Fort Wainwright also accommodated in their planning the environmental conditions that are unique to Alaska. Authorized by Section 801 of the 1984 Military Construction Appropriations Act, 801 housing in fact was intended to be flexible enough to address the needs of particular locations and to create comfortable living quarters for family-oriented, career-minded servicemen and women.

The first segment of 801 housing at Fort Wainwright became known as Birchwood Homes. Upon moving into her home there, Belinda Bower, wife of Staff Sergeant Joel Bower, praised the housing as the best she had ever seen. "I can't believe this is post housing," she commented, especially pleased with the home's interior design and efficiency.[45] Planners of the project addressed two broadly defined objectives: the need to create family-oriented homes and the goal of solving problems associated with Alaska's distinctive environment.

Ft. Wainwright, 801 Housing, 1989.

Family-oriented features included the use of color to distinguish the several clusters of the two-story townhouses that comprised the complex. Interiors featured wide staircases and oversized vestibules to make frequent moving easier; moving vans had access to homes via service spines. Spacious kitchens, wall-to-wall carpeting, and hardwood trim added to the comfort and beauty of the homes. Designers arranged bedrooms to ensure privacy as well as comfort.

Handicapped units had access ramps and downstairs bedrooms, in addition to one or two bedrooms upstairs. Small storage buildings extended off the attached garages. Decks accompanied each unit to allow for outdoor enjoyment during warmer months.

Another family-oriented feature was the street and block pattern. Planners designed this pattern to minimize traffic and to promote safety for the estimated 500 to 800 children that would live in these homes; bus stops with shelters were also provided. The project plan situated "tot lots" where young children could play so that parents could easily see them from their windows. Recreation areas included 17 play areas all linked by an open space path system, a 1.5-mile jogging track, basketball courts, and tennis courts that could be converted into ice rinks during winter months. The developer also provided a full-time maintenance staff.[46]

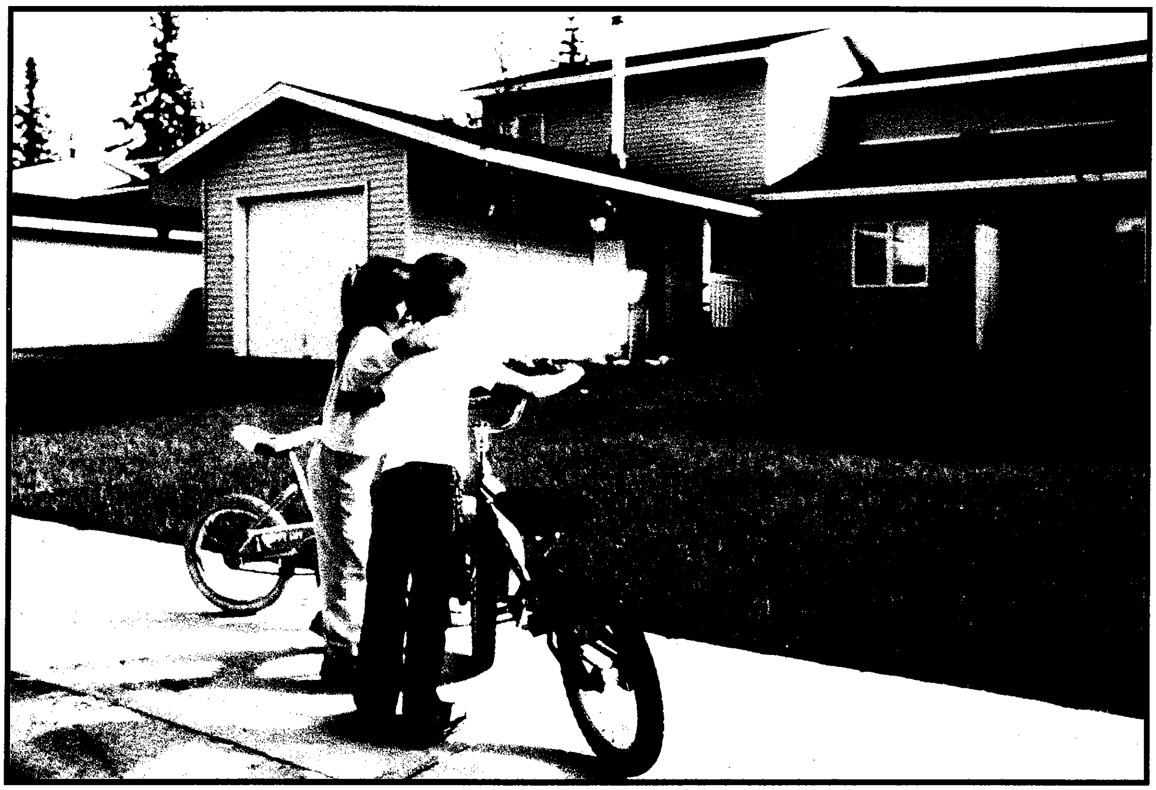
Design features that reflected a response to Alaska's unique environment included installing headbolt heaters next to parking spaces and placing independent thermostats on both the first and second floors of the homes. Also, the project designers set the buildings in a diagonal street pattern to maximize solar

801 Housing interior, 1989.

exposure. This northwest/southeast and northeast/southwest pattern was found to be the most efficient subarctic planning design for allowing as much sunlight into homes and onto streets as possible. In addition, this street and block pattern minimized snowdrifting and mitigated winter winds by avoiding funneling.

Realizing that during long, dark, and cold winters, family activities occur primarily indoors, designers also accounted for environmental conditions in home interior and heating plans. For example, a concern for providing as much sunlight as was realistically possible determined many choices about window shape and placement. Also, by offsetting the buildings 45 degrees to the southeast or southwest, the project plan ensured approximately 16 percent more solar exposure than is found in most conventionally built homes. This orientation also increased energy efficiency and saved annually over 40,000 gallons of fuel.

For heating purposes oil-fired furnaces, each serving four to 12 units, were installed. These were selected for their efficiency, ease of maintenance, and life-cycle cost. Other design choices that reflected concerns about energy efficiency included installing triple-pane windows and using exterior doors that were insulated to R-14 ratings. Walls in every home contained 12 inches of insulation,



Off-post 801 Housing, Ft. Wainwright.

while roofs had 22 inches. Finally, 67 of the 400 units were constructed on permafrost, requiring extra work and expense to support foundations. These features, combined with efforts to maximize comfort and privacy, reflected the project's objectives of providing military housing that recognized changes in Army personnel and responded intelligently to Alaska's distinctive environment.[47]

Birchwood Homes, the first phase of 801 housing construction at Fort Wainwright, was completed in October 1987. The project had cost $52 million. In December of that year, the Corps, at the request of the 6th Infantry Division (Light), sought proposals for a second 150-unit 801 construction project, in this case for off-post housing.[48]

Completed in 1989, Walden Estates, the name given this second group of 801 housing units because of its seven-acre pond, contained many of the same amenities built into Birchwood Homes' project design. Senator Ted Stevens spoke at the ribbon-cutting ceremony that officially celebrated the project's completion. Stevens emphasized that this type of housing met the needs of a new Army, one comprised of married soldiers aiming for careers, rather than single soldiers who had been drafted and lived in barracks with few amenities. Walden Estates housed an additional 1,570 soldiers and their families, who continued to arrive at Fort Wainwright as the deployment of the 6th Infantry Division (Light) proceeded.[49]

At the Walden Estates opening ceremony Senator Stevens also discussed the rapid political changes occurring in Eastern Europe and the Soviet Union, efforts to reduce weapon stockpiles and numbers of troops stationed in Europe, and newly emerging debates about cutting the United States defense budget. Funds for additional military housing at Fort Wainwright through the 801 program were not eliminated in late-December 1989 congressional defense appropriations. Stevens, in fact, had successfully lobbied for modifications in the 801 program to allow the Army to sign long-term leases with owners of existing housing complexes in Fairbanks. Consequently, the Army was authorized to lease up to 450 housing units in the Fairbanks area.[50]

RESPONSE TO CHANGING DEFENSE NEEDS

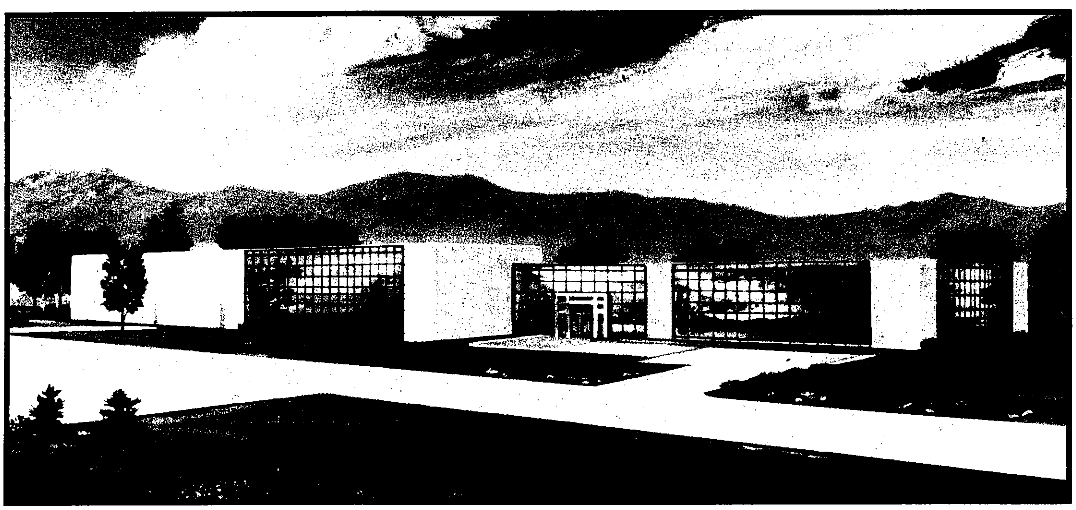
Just one month after Congress authorized the changes in the 801 housing program that allowed the Army to sign long-term leases with landlords in Fairbanks, Defense Secretary Richard Cheney announced a moratorium on all new military construction contracts and on all options under existing contracts until April 30, 1990. Cheney explained that this decision reflected coming changes in the structure and disposition of the U.S. Armed Forces, pending a review of all military commitments. In Alaska this freeze immediately stopped work on seven contracts, including Alaska Air Command projects alone worth more than $20 million. The freeze also affected construction of a proposed physical fitness center at Fort Wainwright, whose estimated value was over $10 million. In May 1990, Cheney extended the freeze into June, just as the House of Representatives was debating a 1991 budget proposal that considered slashing $24 billion from President George Bush's $306.9-billion defense budget. Additional Pentagon cost-cutting proposals included reducing by almost one-half the number of B-2 stealth bombers to be purchased; trimming the numbers of military personnel by 300,000 over the next four years; closing several bases throughout the country; and eliminating, or severely decreasing the funding for, dozens of military procurement and research programs.[51]

Declining global tensions and increasing concern over the size of the federal deficit had combined to introduce questions about the need to reduce defense spending. However, policy makers clearly still recognized the strategic importance of Alaska. In November 1990, the Pentagon announced plans to move its nuclear fighter bomber, the F-15E Strike Eagle, to Elmendorf Air Force Base by October 1991. The Strike Eagle had been based at Clark Air Force Base in the Philippines but, under pressure from the Philippine government, needed to be moved. One journalist speculated that, given increasing arguments against stationing nuclear weapons in either Europe or South Korea, the Pentagon's choice of an Alaskan base to house the F-15E Strike Eagle — and the nuclear missile it was designed to carry — might have revealed yet a new defense role for Alaska and a new set of conditions for the Alaska District to incorporate into its planning.[52]

On the eve of changes in American defense strategy and cutbacks in defense spending, the Cold Regions Test Support Center situated next to Bolio Lake at Fort Greely was completed. John Killoran, Chief of Public Affairs, described the new structure as a "jump forward from the primitive and very old facilities that existed on the site." Killoran noted the Corps' delight with the results of the project, adding that the new facility would greatly increase the "quality of life for the folks who will live there."[53] Once again the Corps had responded to long, cold winters in Alaska with designs and planning that provided energy-efficient, comfortable living quarters.

The Cold Regions Test Support Center took three years to complete. Support for the project reflected the Army's commitment at that time to conduct cold weather research. At the site of the structure 90 miles southeast of Fairbanks, cold arctic air hovers in a topographic depression, creating its own micro-climate. Winter temperatures often drop to 80 degrees below zero. The original facilities — including Quonset huts and outdoor privies connected by uninsulated plywood corridors — had been characterized as "grim" and "a little like Siberia."[54]

The new complex, with 31,000 square feet, was designed to house 20 permanent and 74 temporary personnel. Project architect Bob Bezek explained that the "over-riding concern" in all aspects of design and construction had been to create "a comfortable, flexible and humane living environment that suited the site."[55] Specific features included enormous windows in the day room and dining room from which residents could see the Alaska Range and watch wildlife. Exterior walls were wrapped in Dryvit Outsulation, chosen for its exterior insulation envelope effect. Lieutenant Colonel Karl Woodruff assumed command of the site in June 1989. Woodruff explained that the personnel housed at the new complex would test and develop "everything from canteen caps to rockets." He too praised the complex as "well designed with both the climate and the environment in mind."[56]



Army Reserve Center, Fort Richardson, 1994.

Iditarod Dining Hall, Elmendorf Air Force Base dedication, 1995.

Throughout the period 1975-1992, the Alaska District oversaw numerous military construction contracts. Whether in designing housing and other support facilities for the large numbers of servicemen and women who arrived in Alaska during these years, in building hangars and other base improvements, or in upgrading remote radar stations located throughout the state, the Corps introduced features into its designs that accommodated Alaska's vast terrain, harsh weather, and extreme isolation.

The need to consider measures that would protect Alaska's wildlife also influenced the Corps' approach to military construction projects. At Eagle River Flats, a saltwater marshland that also served as Fort Richardson's artillery training range, the Corps participated in finding the cause of death of thousands of ducks and other birds that used the flats, a mystery that for nearly ten years remained unsolved.

EAGLE RIVER FLATS (ERF)

The saltwater marshlands at the mouth of the Eagle River have long attracted birds, other wildlife, and sport hunters. Biologists have recognized the 2,500-acre ERF, located 15 miles north of Anchorage on the southern side of Knik Arm in upper Cook Inlet, as an important waterfowl staging area. Other animals known to rest and find food at ERF include shorebirds, bald eagles, hawks, cranes, seagulls, ravens, muskrats, beavers, coyotes, and moose. Although bird populations are heaviest during migratory periods, a small number of ducks and shorebirds inhabit the wetlands throughout the summer. Bird counts at ERF during periods of peak migration reach as many as 1,095 geese and 1,530 ducks.[57]

Throughout the 1980s, the cause of death of thousands of ducks, as well as swans, eagles, and other birds who in their migrations stop at ERF, remained unknown. Until a research team at the Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, New Hampshire, conclusively discovered the presence of white phosphorus in bird carcasses and in sediments from ERF, no direct connection had been drawn between the birds' deaths and the firing of white phosphorus artillery and mortar shells at the Fort Richardson artillery range on the flats. Part of the difficulty in determining the birds' cause of death was the lack of similar problems at other United States artillery ranges.

Charles Racine, a CRREL researcher, speculated that ERF bird mortality rates were abnormally high because ERF is a saltwater marsh in a northern climate. Unburned, unoxidized white phosphorus from shelling entered the ponds and was buried in the salt marsh sediments, where, as Racine explained, "anaerobic conditions" were "conducive to long-term storage" of the toxin. Bottom-feeding ducks, like northern pintail and green-winged teal, became the principal victims, ingesting phosphorus while eating seeds and invertebrates. Racine's theory was confirmed when birds continued to die after General Harold Fields, 6th Infantry Division (Light) commander, ordered a halt to the firing.[58]

At ERF, Alaska's dual roles as a strategic deployment area for the military and as northern habitat for many species of wildlife collided head-on. For a decade, thousands of ERF bird carcasses marked the site of impact. The Corps, through CRREL and the agency's laboratory facilities and equipment, responded to this uniquely Alaskan problem to solve the mystery concerning the birds' deaths. Bill Gossweiler, Fort Richardson's fish and wildlife biologist since 1987, acknowledged the Corps' explanation of the high bird mortality: "After a summer of detailed sampling," Gossweiler reported, "scientists at a U.S. Army Corps of Engineers laboratory perfected a test that disclosed the white phosphorus in bird tissue."[59]

First military impacts to the area date from World War II, when the Army began to use ERF as an artillery training range. Weapons fired into the flats included howitzers, mortars, grenades, recoilless rifles, and machine guns. The Army even acknowledged that it had occasionally shot chemical rounds in the area. ERF appeared to be substantively unscathed by these training activities. According to Jon Nelson, USFWS Regional Assistant Director in 1990, "Save for the (artillery) pock marks, [ERF] is still in its natural state." Commenting on the pock holes, however, Bill Gossweiler described the main target area as so full of crater holes that it "looks like the face of the moon."[60]

In the fall of 1982, a group of waterfowl hunters found several duck carcasses at ERF and notified officials of the U.S. Army. Since that time searchers have recovered the remains of thousands of migrating birds that died at ERF.[61] Between 1982 and 1985 alone, officials estimated that nearly 2,000 birds died in a 184-acre "safe zone," adjacent to the 2,500 acres of ERF used by the Army as an impact area for live-fire training exercises.[62]

Initial Investigations

From the fall of 1982 to the spring of 1985, Alan Bennett, then a biologist based at Fort Richardson, joined other scientists to search the area and collect waterfowl remains. Wildlife laboratories analyzed over 80 duck carcasses from ERF. Using these tests, scientists excluded avian diseases and lead poisoning as causes of death. Additionally, numerous sediment and water samples failed to show significant levels of any toxic compound, including heavy metals.[63]

In 1983 and again in 1984, biologists examined the gastrointestinal tracts of birds collected at ERF for total phosphorus. The results showed an increase of over 200 parts-per-million wet weight of phosphorus when compared to control specimens.[64] In August 1984, Bennett submitted a Memorandum for Record to the Army concerning the presence of phosphorus in the carcasses, even though technicians had not determined whether it was inert red phosphorus or "highly toxic" white phosphorus. In the memo, Bennett stated that toxic chemicals, possibly from artillery rounds, had contaminated ERF. "This problem," Bennett asserted, "needs immediate attention."[65]

The Army, however, then felt that it was not its responsibility to determine the cause of waterfowl mortality. During an interview in 1988, Gossweiler noted that six years earlier the Army had requested the USFWS to investigate the problem. As Gossweiler explained, "We went to the [USFWS] and said 'There's a problem. You guys are the experts, so c'mon out here, take a look and figure out what's going on.'"[66]

Although USFWS officials acknowledged that they should have taken the lead in researching the issue, they argued that the Army had not cooperated fully during early investigations. USFWS official Tom Rothe later explained that when USFWS attempted to obtain details regarding the types of ammunition used at ERF "the Army didn't feel it needed to give us that kind of information."[67]

By 1985, the USFWS had started to encourage the Army to become more involved in pursuing the cause of waterfowl mortality at ERF. In May of that year the USFWS, in a cooperative effort with the Army and Alaska Fish and Game, conducted an aerial survey of the saltwater marsh. In a two-and-one-half hour period on May 16, three days after the Army had fired white phosphorus smoke bombs onto the flats, researchers spotted 70 ducks and one eagle that had died. For reasons unclear even to the principal participants, this cooperative investigation sputtered to a halt later in the year. Tom Rothe acknowledged that the USFWS had not considered the waterfowl deaths at ERF a "pressing problem." Rothe also concluded that "the end result was that no one took responsibility."[68]

Formation and Involvement of the Task Force

Even if the problem was not acknowledged as a pressing one, it did persist. Waterfowl continued to die at Eagle River Flats. In 1987, the U.S. Army 6th Infantry Division (Light), the USFWS, the Environmental Protection Agency, the Alaska Department of Fish and Game, and the Alaska Department of Environmental Conservation formed the ERF Interagency Task Force to renew the investigation of the ERF problem. Under the auspices of the task force, a team of scientists sampled mud, water, and carcasses collected from ERF for evidence that military explosives poisoned the waterfowl. By late 1988, the task force had eliminated infectious diseases, botulism, lead poisoning and bodily injury as probable causes of death.

Initially, many officials with state and federal wildlife agencies questioned the task force's apparent duplication of work already accomplished during initial studies of the early 1980s. "The task force is tiptoeing around the real issue," complained Dan Rosenberg, a state game biologist and the Alaska Department of Fish and Game task force representative in 1988. "Rather than explore all possible causes we should look at the most common-sensical cause." Others agreed and criticized the task force for "re-inventing the wheel."[69]

Those in charge of the new effort, however, defended their methods. Bob Bowker, head of the task force in 1988 and field supervisor for the USFWS Anchorage Office, cited two reasons for the repetition of earlier studies: the questionable validity of past data and the need to foster a spirit of cooperation among task force members missing from previous efforts. Bowker noted the need to move past the "finger-pointing, disagreements over jurisdiction, and threats — real or imagined — between the task force's two principal parties, the USFWS and the Army."[70] Those involved believed that the task force had successfully focused on the scientific problem it faced, rather than becoming embroiled in politics. In 1993, the Department of the Interior praised the task force for working "harmoniously" toward solving the problem.[71]

In 1989, the task force contracted Hunter Environmental Services (HES) to study ERF and determine the toxin that killed the waterfowl. In early 1990, HES produced a report that claimed an 80-to-90-percent chance that compounds from artillery munitions were to blame, although the report did not pinpoint the specific lethal chemical. Upon receiving the report, Fort Richardson's General Harold Fields temporarily closed the range until the toxin could be isolated.[72]

Corps' Involvement

Because of CRREL's expertise with munitions chemistry and its experience in Alaskan wetlands ecology, the U.S. Army Toxic and Hazardous Materials Agency requested that CRREL test HES's hypotheses.[73] Corps' personnel with CRREL soon realized that prior studies were inadequate and that conditions required much more intensive sampling of ERF sediments in order to detect the presence of a poison.[74] In the spring of 1990, wearing snowshoes to reduce the chances of detonating unexploded shells, CRREL personnel collected samples from the areas of highest contamination.

CRREL's knowledge about Alaskan wetlands ecology led to quick recognition of the need for more sediment and water samples. Also contributing to the research team's success were temporary labs established at ERF and the use of the Alaska District's chemistry laboratory, which ensured speedy analysis of samples. When CRREL began to test sediments for white phosphorus, scientists noticed some soil samples emitted smoke when exposed to air. Their experience with army munitions enabled them to recognize the smoke as originating from white phosphorus — a fact confirmed later, using reliable analytical methods.[75]

On September 23, 1990, CRREL scientists announced that they had isolated white phosphorus in the tissue of dissected birds that had died at ERF. In a subsequent statement to the press, Gossweiler praised the work of the Corps specialists at CRREL. "Up 'till now," Gossweiler said, "I don't think anyone had developed the technique [to isolate white phosphorus]."[76] In February 1991, after confirming the origins of the white phosphorus, CRREL researchers announced their conclusion that ingestion of the substance caused the waterfowl deaths.

Immediately, the Regional Director of USFWS recommended that the Army close the range permanently.[77] In July of 1993, the Department of the Interior announced that Fort Richardson, including ERF, had been placed on the National Priorities List for environmental reclamation.[78]

The Corps' participation at ERF through CRREL mirrored a vision of the Corps as an environmental engineering agency, countenanced by General Henry Hatch, then-Commander and Chief of Engineers, and Robert W. Page, Assistant Secretary of the Army for Civil Works.[79] Dating from the passage of the Defense Appropriations Bill in December 1983 that allocated funding for nationwide environmental restoration of defense sites, the Corps increasingly gained experience in this new application of its engineering and contracting capabilities.