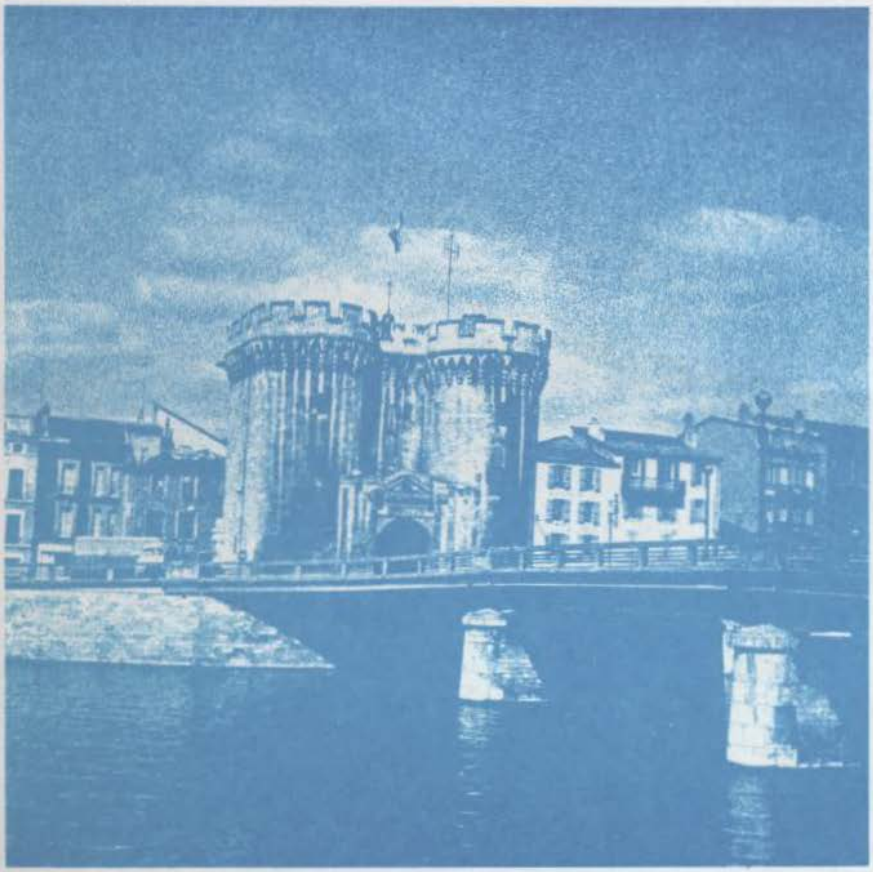
CEHO Engineer Pamphlet 870-1-1	Department of the Army U.S. Army Corps of Engineers Washington, DC 20314-1000	EP 870-1-1 18 May 79
	HISTORICAL VIGNETTES Volume 2	
	Distribution Restriction Statement Approved for public release; distribution is unlimited.	

EP 870-1-1
Volume 2

historical vignettes



Department of the Army Office of the Chief of Engineers Washington, D.C. 20314

COVER

The castle insignia of the Corps of Engineers symbolizes fortification, a traditional activity of military engineers. A stylized reproduction of the old Porte Chausee of the city of Verdun, the castle reminds today's Engineers of their military heritage and of the great military engineers whose heirs they are.

HISTORICAL VIGNETTES

HISTORICAL DIVISION
OFFICE OF ADMINISTRATIVE SERVICES
OFFICE OF THE CHIEF OF ENGINEERS
1979

Reprinted - 1988

EP 870-1-1

FOREWORD

These *Historical Vignettes* reflect in miniature the United States Army Corps of Engineers' many contributions to the American nation in peace and war. The wide variety of this collection is a tribute to the scope of Engineer interests and to the ingenuity of those who have served the Corps through adversity and triumph since the beginning of the Republic.

The anecdotes in this volume provide brief but significant glimpses of the history and traditions that are the proud heritage of all members of the Corps of Engineers, military and civilian. They supply the practical substance of speeches and public information programs, but as a record of achievement, individual endurance and ability, and wry wit, they also mirror the people the Corps of Engineers has served for over two hundred years.

FOR THE CHIEF OF ENGINEERS:

THORWALD R. PETERSON
Colonel, Corps of Engineers
Executive Director, Engineer Staff

HISTORICAL VIGNETTES

Contents

CHAPTER 1 *THE CORPS CARES—AND ALWAYS HAS*

Engineering for the Environment:
Canalizing the Upper Mississippi 1
Partners in Conservation:
Sturgis on the Environment 2
Concern for an Endangered Species:
The Buffalo 3
The Corps and Fish Conservation During the 1870's and 1880's 4
Saving a Fishery in the 1880's 5
Captain Pope's Vision:
The Greening of the Llano Estacado 5
Engineers and Public Health 6
Ending Past Abuses:
The Corps of Engineers and Lake Harwell 7
The Impact of the 1936 Flood on the Susquehanna River Basin 8
Early Engineer Concern Over the Depletion of the Columbia River Fisheries: Major William A. Jones's Report, 1888 9

CHAPTER 2 *MEETING WARTIME CHALLENGES*

The Making of an Atomic Engineer:
Kenneth D. Nichols 11
From Homefront to Battlefront in the Korean War 12
Solving Problems for MACV:
Dredging in Vietnam 13
Tulsa Responds in Peace and War 15
Dust Control in Vietnam 16

POL Facilities in Vietnam 17
Rufus Putnam's Chandeliers: The Fortification of Dorchester Heights, 1776 18
Building the Atlantic Bases 19
End Runs Toward Lae 21
Showing What the Corps Can Do During a Crisis 22

CHAPTER 3 *MEMORABLE ENGINEERS*

The Many Roles of an Engineer: U. S. Grant III 25
The Engineer as Humorist: George H. Derby in San Diego, 1853 26
The Engineer as Archeologist: James H. Simpson in the Southwest, 1849 27
Three Memorable Corps Civilians: Green, Williamson and Koonce 27
Engineer as Steamboat Designer 29
Major General James B. McPherson: Engineer and Army Commander 30
The Engineer as Cartographer: Lieutenant Gouverneur K. Warren's Map of the Trans-Mississippi West 31
Portrait of an Engineer: Defender of New York in 1814 32
The Use of Civil Experience in Wartime: Gouverneur K. Warren at Gettysburg 33

CHAPTER 4 *RAPID RESPONSE:—DISASTER RELIEF AND RECOVERY*

Ill Winds: Hurricanes Camille and Agnes 35
The Great Upheaval: The Alaskan Earthquake, 1964 36
The Benefits of Military Training: Colonel Eugene Reybold and the 1937 Flood 38
"A Globe of Compression": Brig. Gen. Joseph G. Swift and the New York Fire of 1835 39
Texas City Explosion 40

CHAPTER 5 *BUILDING A BETTER AMERICA*

Upgrading the Urban Environment: Rock Creek and Potomac Parks 41
Captain William Ludlow and the Preservation of the Yellowstone Wonderland 42
Emergency Power: The Nuclear Power Barge *Sturgis* in the Canal Zone 43

Energy for America:
Charles Keller and Niagara Falls 44
Combating Unemployment in the Great Depression 45
New Life and New Hope: The Struggle for Economic
Recovery in Hawaii 47
Building The First Interstate Highway 48

CHAPTER 6 *RAILROADING IN PEACE AND WAR*

The First Mile:
Army Engineers and the B&O 51
The Moosegooser's Route:
Uncle Sam's Alaska Railroad 52
First to France:
Railway Engineers in World War I 54
A Railroad for General Patton 55
A Stride Toward a National Railroad Network:
The Pacific Railroad Surveys 56

CHAPTER 7 *STRENGTHENING THE FREE WORLD*

Rehabilitation in Greece 1947 - 49 59
Building the ICBM Bases 60
Building the Base at Thule 62

CHAPTER 8 *CIVIC ACTION*

Building a Sports Field in Occupied Germany 65
Aid for Earthquake Victims in Morocco 66
Bridge Building in Tunisia 66
Suspension Bridges in Afghanistan 67

CHAPTER 9 *ANECDOTES AND BRIEF ITEMS*

The Working End of an Engineer 69
The Ability to Say "No" 70
Captain Meigs and His Great Water Kettle 70
On Professionalism 71
Mark Twain's Myopia 71
Engineering for Posterity 72
Telling It Like It Is 72
How to Get Things Done in the Army 73
An Example of Good Leadership 73
Only Make-Believe 74
Every Man in His Place 74
One Man's Castle is Another Man's Pen 75
Up in Smoke:
William Ludlow and the $50 Bill 75

CHAPTER 10 *HIGHLIGHTS AND SIDELIGHTS*

The Camels and The Corps: Lt. William H. Echols's Reconnaissance of West Texas 77
The "Great Abstraction": The Corps and The Washington Monument 78
The Final Voyage of the U.S.S. *Maine* 78
Where the Hens Laid Hard-Boiled Eggs: Lieutenant Derby at Fort Yuma 80
Maps for NASA 81
A Case of Mistaken Identity: The Groves That Moved 82

CHAPTER 11 *QUOTABLE QUOTES*

The Military-Civil Mission 83
A Healthy Sense of Curiosity 83
A Toast to the Eagle that Looks like a Duck 84
The Importance of Civil Works for Military Engineers 85
The Military-Civil Mission 85
Washington's Devout Wish 86

CHAPTER 1
THE CORPS CARES—AND ALWAYS HAS

Engineering for the Environment: Canalizing the Upper Mississippi

The years of the Great Depression found the Corps at work on the upper Mississippi, opening the river to modern barge traffic by transforming it into an "aquatic staircase" of navigation pools behind dams. By means of the dams, training works, and dredging, the Engineers planned to create a 9-foot navigation channel—but the effect on the natural and human environment remained to be seen.

Recreation was first to benefit as Engineers agreed to improve the navigation pools for enjoyment as well as commerce. Assuring a local leader that "I still enjoy seeing dogwood, redbud, and hawthorne blossoms (even though I am an Army Engineer)," Colonel Paul S. Reinecke of the St. Louis District secured Works Progress Administration (WPA) funds and hired 1,800 unemployed to build a scenic drive along the pool created by recently-built Dam No. 26. Important to the region's ecology was the Corps' decision to redesign two large dams near Winona, Minnesota, in the St. Paul District. Aiming at stabilized water levels to avoid injury to birds during the nesting season, the Engineers created "a fine example of how large dams may help wildlife resources." In the words of Ira N. Gabrielson, Franklin D. Roosevelt's director of the Biological Survey: "These dams, which might easily have been so designed as to destroy most of the wildlife value of this great area, are actually increasing these values." No conservation organization, Gabrielson later declared, could have helped wildlife in the area as much as the Corps did by building the 9-foot channel.

Many other benefits accrued. Before the project was undertaken, it was not uncommon for millions of fish to be caught in sloughs by low water and die. Completion of the channel helped to reclaim 194,000 acres of sloughs and backwater, which the Engineers turned over to state and federal wildlife services for use as refuges. Dam gates were designed to permit migration of fish. Seeds and berries of the dogwood, redbud, and hawthorne named by Colonel Reinecke

fed wintering birds. Bargemen saw the region as a new water highway; but it was also part of the Mississippi flyway for migratory flocks, a waterway for fish, and along parts of its banks were parkways for human recreation.

To Americans of the Depression-harried Thirties, the main story of canalization no doubt lay in new economic opportunities and employment of the jobless on all the major building projects involved. Sensitive handling by Engineers working with conservation agencies insured that a later generation would see the project as a contribution to the total regional environment.

Albert E. Cowdrey

Source: (1) St. Louis and Rock Island District histories. (2) Ira N. Gabrielson, *Wildlife Refuges* (New York, 1943), 193. (3) "Floods and Wildlife," *Scientific American*, 156 (Feb., 1937), 101.

Partners in Conservation: Sturgis on the Environment

Lieutenant General Samuel D. Sturgis, Jr., Chief of Engineers from 1953 to 1956, presented the Corps as a partner in the fight for conservation long before "environment" became a household word. He traced his own love of nature to his boyhood, recalling fishing trips in the "Wisconsin white pine forest with a cold clear tinkling trout stream meandering through the dark green, stalwart pines and moss-covered windfalls." As Chief of Engineers, he declared in 1953: "We must obey the laws of nature and work in harmony with natural forces rather than against them. Man cannot dominate these forces," he added, "but, by working in harmony with them, he can preserve the heritage of future generations."

All forms of conservation interested him, from soil to wildlife. The destruction of forests filled him with "real pain", and he regretted that in the march "of what we often inaccurately term 'civilization', some values are likely to be lost."

The Corps, he believed, could help the cause of conservation. On coastal and inland waters it could provide shelter for wildlife. Already its projects furnished "more than 3.5 million acres of land for some form of wildlife management and recreation." And he hoped to see "resting grounds for migratory game, refuges, managed public hunting, fish culture, game management, research, laboratories, field headquarters for wildlife research and administration, arboretums" —all aimed at "public use and enjoyment of wildlife resources." He concluded an address to an audience of conservation commissioners by declaring: "The Corps stands ready and willing to join with each

of you and give you every possible assistance which our authorized functions permit to obtain the greatest practicable benefits for wildlife from our projects."

Albert E. Cowdrey

Source: Remarks by Major General S. D. Sturgis, Jr., before the International Association of Game, Fish and Conservation Commissioners, Milwaukee, Wisconsin, 14 September 1953.

Concern for an Endangered Species: the Buffalo

Lumbering, shaggy masses of broad-shouldered, spindly legged buffalo covered the western grasslands in the years before the Civil War. A mobile commissary that provided the plains Indians with food, clothing, and shelter, the vast herds seemed limitless to astounded travelers. Yet, even then, voices warned of their impending destruction. Frequently these voices belonged to Army Engineers.

In 1845, two Topographical Engineers, Lieutenant William B. Franklin on the Platte River and Lieutenant James W. Abert on the Arkansas, heard Indians tell of the decline of the buffalo. Franklin recorded the views of the Cheyenne chief Old Soldier: "He was convinced that something must be done . . . as the buffalo were getting scarce, and unless [the Western Indians] found some other way of living, they must starve." Both Franklin and Abert wrote at length in their reports of the serious effects the demise of the buffalo would have on tribal life.

Four years later, as the western migration swelled with gold-seeking Forty-Niners, Captain Howard Stansbury saw fewer buffalo than Franklin and Abert had reported. The herds, Stansbury noted, "have fled before the advancing tide of emigration. Driven from their ancient and long-loved haunts, these aborginal herds, confined within still narrowing bounds, seem destined to final extirpation at the hands of men."

Captain William F. Raynolds, on his way to the upper Yellowstone in 1859, was appalled by the wholesale slaughter of buffalo cows for their skins. "Another generation," he predicted, "will witness almost the entire extinction of this noble animal." Regrettably, Raynolds' prophesy came true.

In the early years of the 1870's the herds almost vanished in a blaze of fire from Sharps and Remington forty-fours. When the smoke from the buffalo-hunters' rifles cleared, little remained but mounds of rotting meat and piles of hides and bones. The warnings of the Engineer explorers—Abert, Franklin, Stansbury, and Ray-

nolds—went unheeded, and the buffalo came within a hair's breadth of extinction.

Frank N. Schubert

Source: (1) Tom McHugh, *The Time of the Buffalo* (New York: 1972. (2) James W. Abert, *Report of His Examination of New Mexico*, Ex. Doc. 41, 30th Cong., 1st sess. (3) William B. Franklin, *Report, Expedition to the South Pass of the Rocky Mountains.* (4) Howard Stansbury, *Exploration and Survey of the Valley of the Great Salt Lake of Utah*, S. Ex. Doc. 3, 31st Cong., spec. sess. (5) William F. Raynolds, *Report on the Exploration of the Yellowstone River* (Washington: Government Printing Office, 1868).

The Corps and Fish Conservation During the 1870's and 1880's

Cooperation between Army Engineers and environmentalists is by no means new. A century ago, the Corps assisted the fledgling United States Commission of Fish and Fisheries in its efforts to preserve marine life. Engineer involvement in the Commission's work took many forms, from the construction of fish ladders on the Potomac to dredging ponds for the St. Jerome's Creek oyster hatchery on the eastern shore of Chesapeake Bay.

Perhaps the most significant assistance was rendered at Wood's Hole, Massachusetts, where Spencer F. Baird, the first Commissioner of Fish and Fisheries, laid the groundwork for the complex and sophisticated oceanographic laboratories currently in operation. Engineer officers surveyed the harbor, planned and built the pier and breakwater that protected the Commission's hatcheries and ships, and supervised construction of buildings for the first laboratory.

Throughout the formative years of the Fish and Fisheries Commission, the Corps contributed its experience and expertise to the preservation of aquatic animal life.

Frank N. Schubert

Source: *Annual Reports of the U.S. Commissioner of Fish and Fisheries, 1879 - 1885.*

Saving a Fishery in the 1880's

In the 1880's the Corps of Engineers helped to build a fishery at Havre de Grace, Maryland, and also saved it from destruction. Beginning in 1881, in conjunction with navigation improvements on the Susquehanna River, the Corps built facilities for the United States Commission of Fish and Fisheries. The Baltimore District dredged portions of the channel to aid boats traveling to the fishery, built landing docks, and laid foundations for the hatchery. Upstream, Baltimore District Engineer Colonel William P. Craighill constructed a wooden breakwater of crib design to protect the fishery from ice-flows on the Susquehanna.

During December, 1887, a blizzard struck the Susquehanna basin and the river froze. Craighill realized that unless steps were taken promptly to fill the crib with stone, it would be totally destroyed. In the emergency he sent a tug to break up the ice in the river and keep the channel open. He also hired men to remove ice around the breakwater. The workers toiled in bitter cold, hauling stone by hand through icy water to fill the crib. Such arduous labor required, what Craighill termed, "extraordinary inducements"—the then handsome wage of $2.50 per day. To avoid delays he kept the workmen at the site around the clock for three days, supplying them with food from country stores in Havre de Grace. On the last day of December Craighill reported that the "crib was saved, sunk in place, and is now in position." The fishery suffered no damage.

Harold K. Kanarek

Source: Harold K. Kanarek, *The Mid-Atlantic Engineers: A History of the Baltimore District of the U.S. Army Corps of Engineers, 1794 - 1974.*

Captain Pope's Vision: The Greening of the Llano Estacado

Exploratory well-digging by Corps personnel, begun recently to increase the water supply of metropolitan Washington, calls to mind an Engineer's efforts to find underground sources of water on the Llano Estacado of western Texas 120 years ago. When Captain John Pope, a Topographical Engineer making a survey for a railroad route to the Pacific, crossed the arid tableland in 1854, he predicted a great future for the region in cotton culture. The water for such a transformation, he believed, would come from artesian wells.

Supported by few and derided by many, Captain Pope bored numerous holes in the dry crust of the plateau. His vision was keen-

er than his drills. Bit after bit broke before penetrating deep enough to strike water.

After the development of machinery to fit the dream, vast underground reservoirs of water made Texas cotton for a time even more valuable than Texas oil. And around Lubbock, on the once forbidding Llano Estacado, the cotton plants wave in the wind, monuments to the vision of an Engineer who was ahead of his time.

Frank N. Schubert

Source: (1) Martin L. Crimmins, "Captain John Pope's Route to the Pacific," *The Military Engineer*, 23 (March - April 1931). (2) W. Eugene Hollon, *The Southwest: Old and New* (New York: Alfred A. Knopf, 1961).

Engineers and Public Health

Selection of the Corps by the Environmental Protection Agency (EPA) to oversee construction of $24.5 billion in water-cleanup projects recalls past Engineer work in water purification, sewage disposal, and the general field of public health.

In the work of providing pure water to drink, the Engineers began at the top—by providing it to the President and the First Family. In 1824, Engineers piped water from a spring on K Street to supply the White House, previously dependent on shallow wells. Engineer work then expanded to the rest of the nation's capital. In the 1840's, future Chief of Engineers, Lieutenant Andrew A. Humphreys, assisted in work that included installation of the first sanitary sewer in Washington, on 15th Street. Climax of Corps efforts was, of course, the building in the next decade of the Washington Aqueduct by Captain Montgomery C. Meigs—the foundation of the capital's water system, most of it still functioning today. In a growing urban area plagued by a host of filth-borne diseases, Engineer work laid an indispensable foundation for the future eradication of typhoid and cholera.

After the Civil War, Engineer work expanded. The raising of the Potomac and Anacostia flats saved thousands of lives, especially among the city's poor, who lived in malaria-scourged riverside neighborhoods. In the twentieth century, working with top civil consultants, the Engineers directed the building of a system to pump the city's sewage under the Anacostia by means of an inverted siphon and constructed the sewage treatment plant at Blue Plains. Meanwhile, the late nineteenth century had seen other American cities call for Engineer assistance to solve their own water problems. Detailed by the Chief of Engineers, Colonel George H. Mendell served dur-

ing the 1870's as consultant engineer to the Water Commissioners of San Francisco and the State of California. In the 1880's, Captain William Ludlow helped to give Philadelphia its modern water system against the opposition of some ignorant and spoils-minded local politicians.

And, as the end of the century approached, Engineers carried their cleanup work to U.S. possessions and administered areas overseas. Now a brigadier general, Ludlow as Governor of Havana (1898 - 1900) directed a full-scale sanitary reform of this disease-ridden tropical port. Work included plans for sewers, pumping stations, and an improved water system. Lieutenant Lytle Brown, a future Chief of Engineers, helped to carry out similar improvements in Manila, the Philippine Islands.

The record of the engineering profession as a whole is a distinguished one in the field of public health. Long before the true causes of epidemic disease were understood, engineers moved out ahead of medical researchers to provide practical solutions to pressing public problems. In that record of service, Corps members have shared fully. Today, human health remains an important aspect of efforts to preserve the total web of life through environmental engineering. It is fitting that the Corps should shoulder new responsibilities in a field in which it has long excelled.

Albert E. Cowdrey

Source: (1) Albert E. Cowdrey, *A City for the Nation.* (2) Richard H. Shryock, *The Development of Modern Medicine.*

Ending Past Abuses: The Corps of Engineers and Lake Harwell

One of the major benefits of Corps flood control work has been the water recreation facilities created by dams and their reservoirs. Although the Federal government generally owns the land bordering the lake, private possession of the remainder is the general rule. Under Federal authority, the Corps of Engineers grants permits for the construction of docks, piers, boathouses, and other water related structures. Such facilities inevitably enhance the resale value of private dwellings built on Corps lakes.

At Lake Harwell, Georgia, a major protest arose when the Corps attempted in 1974 to control building and burgeoning development that threatened possible despoliation of the lake. Largely due to the easy access to the water, value of land along the reservoir had risen from $35 an acre to as much as $25,000 for one-third of an acre.

New Corps regulations that ended the *pro forma* reapplication and transfer of permits from one property owner to another were aimed at concentrating development in one or two areas, leaving most of the lake in its natural condition. Major General Ernest R. Graves, Director of Civil Works, Office of the Chief of Engineers, (OCE), observed that anything less would mean conveying interest in public land to private individuals.

Despite Congressional hearings and criticism, as well as indignant public protest, the new lakeshore management regulations went into effect. Reaction was harsh. One attorney asserted that the Army has treated its "fellow Americans with a callousness that we have not experienced since General Sherman made his infamous march through Georgia." Such was the price the Corps of Engineers had to pay for increased environmental responsibilities.

Dennis S. Lavery

Source: U.S. Congress, House of Representatives, Committee on Public Works. *Lakeshore Management Policies and Practices at Lakes under the Jurisdiction of the U.S. Army Corps of Engineers.* Hearings. 94th Cong., 2d sess., 1976.

The Impact of the 1936 Flood on the Susquehanna River Basin.

During calamities such as floods, earthquakes, and fires, the Corps of Engineers is often the first organization on the scene dispensing relief to disaster victims. The flood of March 1936 in the Susquehanna River Basin in New York and Pennsylvania was no exception. For almost two weeks rain fell on melting snow, and the resultant violent waters devastated the central Atlantic region. Property damage in the basin amounted to over $67 million. But in the aftermath of the disaster, the Corps' contribution to the improvement of the quality of life in the basin went far beyond rescue and clean up operations. As a result of the flood, Congress adopted a comprehensive program of federal flood protection for the communities along the Susquehanna to be carried out by the Army Corps of Engineers.

Since 1936, the Corps has built dams, levees, flood walls, and pumping stations that have meant more to the Susquehanna Valley than simple flood control. Through these projects, the Corps has implemented a conservation policy which has improved water quality, fostered aquatic life, stopped soil erosion, and provided vast recreation areas. For example, the Pennsylvania Game Commission uses the land of the Indian Rock Dam at York, Pennsylvania, for wildlife

conservation and management. Three major Corps dams on the Susquehanna's West Branch all have large picnic, camping, beach, and boating facilities serving hundreds of thousands of people annually. Before the construction of the Curwensville Dam in Clearfield County, Pennsylvania, acidic mine wastes polluted the water in the West Branch and killed all fish upstream from Lock Haven. Since then, the Engineers have been able to use the dam to control the flow of the acid water downstream. This, combined with increased state efforts to curb mine waste, has restored fish to the river. All three of the West Branch reservoirs are aesthetic triumphs covering ugly scars left by strip mining.

In New York, the Corps has transformed reservoirs at Whitney Point, East Sidney, and Almond into scenic lakes with swimming, boating, fishing, and picnic areas. Most recently, at Raystown on the Juniata River in Pennsylvania, the Corps has built a flood control and recreation dam large enough to supply future electric power. Finally, the Corps is an important member of the Susquehanna River Commission. This agency is responsible for preparing an economic plan for the basin, taking into consideration environmental quality, regional development, and economic efficiency.

Thus, the 1936 Flood Control Act marked a turning point for Corps operations in civil works. It signaled a change from the improvement of navigation to the multi-purpose development of the nation's waterways. In the Susquehanna River Basin, the change has meant an increase in the size and number of projects and a strong role in planning the region's landscape and environment.

Harold Kanarek

Source: Harold Kanarek, *The Mid-Atlantic Engineers: A History of the Baltimore District of the U.S. Army Corps of Engineers, 1794-1974.*

Early Engineer Concern Over the Depletion of the Columbia River Fisheries: Major William A. Jones's Report, 1888

Long before the construction of Bonneville Dam and its famous fish ladders, Major William A. Jones of the Corps of Engineers warned that the Columbia River salmon required protection. An experienced Engineer and explorer, known for the discovery of Togwotee Pass through the Wind River Mountains, Jones wrote his *Report on the Salmon Fisheries of the Columbia River* while serving as Portland District Engineer. Gazing at the maze of nets, traps, and fish wheels that clogged the Columbia near Astoria, he concluded

that it was "a sort of miracle that any [large] fish escape to go up the river. . . ."

Major Jones also proposed means for mitigation of the threat to the fisheries. Along with continuation of the practice of closing the river to fishing at regular intervals, he recommended an increase in the number of hatcheries and uniformity between the fish laws of Oregon and Washington. Although his suggestions were not adopted until well into the twentieth century, Jones recognized the threat to the survival of the salmon fisheries many years before the general public became aware of the problem.

Frank N. Schubert

Source: Major William A. Jones, *Report on the Salmon Fisheries of the Columbia River*, Senate Executive Document 123, 50th Cong., 1st sess., 1888, 15-62.

CHAPTER 2
MEETING WARTIME CHALLENGES

The Making of an Atomic Engineer: Kenneth D. Nichols

Manhattan District insiders gave major credit for development of the atomic bomb to the little publicized Engineer colonel who headed the District from 1943 to 1945. To many of them, Kenneth D. Nichols was the real hero of the piece. Dr. Vannevar Bush, who headed the Office of Scientific Research and Development, expressed "great admiration" for the leadership Nichols displayed. Lieutenant General Leslie R. Groves, overall director of the atomic project, rated Nichols "an excellent choice" with "an extraordinary grasp of technical and scientific details." Nobel laureate Arthur Compton, one of the scientific greats behind the bomb, described Nichols as "a man who really understood" the scientists' problems, "who had a clear view of justice. . . , and who was completely straightforward and courageous." In his book *Atomic Quest*, Dr. Compton noted:

> It was Nichols on whom Groves depended to see that the gaseous diffusion plant [at Oak Ridge, Tennessee] was carried through to successful completion and production. . . . Without the product of this plant the bomb that destroyed Hiroshima and shocked Japan into resigning from the war would not have been made in time.

Nichols joined Manhattan Project in the summer of 1942, when Colonel James C. Marshall, its first Manhattan District Engineer, chose him as his deputy. At the time, the 34-year old West Pointer was Area Engineer at the Pennsylvania Ordnance Works, a $50 million TNT plant under construction near Allenwood. His earlier background included several tours at the Waterways Experiment Station, the Corps' hydraulics laboratory at Vicksburg, Mississippi; canal survey work in Nicaragua; and four years as an instructor at the U.S. Military Academy. Brilliant and scholarly, Nichols had studied at the Technical University in Berlin and had earned two advanced degrees, an M.C.E. from Cornell and a Ph.D. from the State University of Iowa. His record as deputy was impressive; and, in mid-1943,

when Colonel Marshall received a promotion and left for duty overseas, Nichols moved up to be District Engineer.

In 1953, shortly before he retired from the Army, Nichols, then a major general, was asked about the secret of his wartime success. His answer was illuminating: research experience at Vicksburg coupled with academic contacts there; the opportunity afforded him by the Corps to pursue his education; and "the patience, persistence, drive, and guts" developed in handling river and harbor projects. In summary, Nichols said: "No strictly military experience during the period 1929 to 1941 could have been of such magnitude as to be in any way comparable with the Manhattan Project.... Without river and harbor assignments, I probably would have lacked most of the [necessary] experience factors."

Lenore Fine

Source: (1) Ltr, Bush to Historical Division, 27 Jan 64. (2) Leslie R. Groves, *Now It Can Be Told* (New York: Harper & Brothers, 1962), 29. (3) Arthur H. Compton, *Atomic Quest* (New York: Oxford University Press, 1956), 106 - 107. (4) Ltr, Nichols to CofEngrs, 9 Apr 53.

From Homefront to Battlefront in the Korean War

In the predawn darkness of 25 June 1950, a barrage of artillery and mortar fire signalled the invasion of South Korea by Communist North Korea. The following day President Harry S Truman ordered American armed forces to go to the aid of the non-Communist South. The Korean War had begun. In the struggle, U.S. Army Engineers played many roles. Perhaps the most versatile Engineer performance was that of the civil-military force-in-being in the United States.

In districts and divisions throughout the country, the emphasis switched from civil to military tasks. In San Francisco a typical pattern emerged. At the outbreak of war, 71 percent of district personnel were in civil works and 29 percent were in military construction; by the end of 1951, 84 percent were assigned to military work. In the Sacramento District, the cost of military construction rose from zero to $37 million in 3 years; at Tulsa, a $1 million military program increased to $50 million; the Buffalo District administered a military procurement program that peaked at $21 million annually.

District responsibilities began at the factory doors and reached to the fighting front. All along the line the Corps displayed military speed plus expert knowledge. Ordered to reactivate Fort Huachuca in Arizona, the Los Angeles District Engineer called in civil employ-

ees and had construction underway within two days. The Fort Worth District undertook military construction at seven air bases, at supply depots and at Fort Hood, Texas. The St. Louis District procured items ranging from barbed wire to prefabricated buildings, awarding 6,000 major contracts and expending $163 million for direct purchases. The same district dispatched the hopper dredge *Davison* to Korea in record time.

A battlefield problem that brought together the districts and the fighting Engineers of the Eighth Army was the tidal basin at Inchon, the harbor of Seoul. Here 30-foot tides made a tidal basin essential for the unloading of ships during low water. When the United Nations forces were in retreat, the 50th Engineer Port Construction Company dismantled the locks of the tidal basin; and, afterward, rebuilt them when free world troops returned. The Chicago District sent its chief of operations to inspect the locks, and the plans he prepared became the basis for rehabilitation of the harbor.

Lessons learned from the emergency were summed up a decade later by Los Angeles District Engineer Lieutenant Colonel Arthur R. Marshall, who stated: "The extremely fast reaction times, technical knowledge, and ability to expand overnight to accomplish vital military and disaster projects are directly due to capabilities developed and sustained by the Civil Works mission." Nowhere were Marshall's words more clearly proved than in the Korean emergency.

Albert E. Cowdrey

Source: (1) Civil Works Study Board records. (2) R. G. Lovett and B. S. Shute, "Army Engineer Procurement," *The Military Engineer*, 43 (March - April 1951), 87 - 91. (3) William McCollam, Jr., "Raising the Tidal Basin Lock Gates at Inchon, Korea," *The Military Engineer*, 44 (March - April 1952), 96 - 101.

Solving Problems for MACV: Dredging in Vietnam

A monumental congestion of shipping at the few Vietnamese ports of entry created a logistic nightmare in the first year of the American build-up. For this reason, in November 1965, Rear Admiral Alexander C. Husband, Officer in Charge of Construction (OICC) Vietnam, asked Lieutenant General William F. Cassidy, Chief of Engineers, for assistance in the dredging of channels into Vietnamese ports. Before the end of the year Husband and Cassidy signed a memorandum of understanding governing Corps of Engineers participation in this activity.

Since 1855 the Corps of Engineers has been building and operating seagoing hopper dredges for the opening and improvement of navigable waterways under its jurisdiction. A hopper dredge is an ocean vessel with propulsion machinery and special apparatus for dredging material into built-in hoppers, and transporting and dumping the spoil at a disposal site. During World War II the Corps of Engineers operated hopper dredges for the U.S. Army in both the European and Pacific theaters.

Because of shallow waters, the Civil Works Directorate, OCE, selected the *Davison*, one of six 700-cubic yard shallowdraft dredges constructed during World War II, for operations off Vietnam. Fitted out for the long ocean voyage and manned by a Corps of Engineers crew, this vessel reached Vietnam around March 1966, accompanied by the *Tudor*, a 65-foot T-boat equipped for survey and sub-bottom exploration. These vessels were attached to the Navy and placed under the operational control of OICC Vietnam.

The *Davison* completed its initial assignment of dredging the entrance channel at Chu Lai in mid-June 1966, removing 600,000 cubic yards and providing an excellent channel for LST's. The dredge next opened an interim deep-draft entrance channel 34 feet deep and 200 feet wide to the inner harbor of Qui Nhon. Subsequently, it deepened the shallow channels of other ports, and, with later dredges, did much to break the shipping jam. At the end of December 1966 this vessel departed for Guam for repairs.

Anticipating the requirement for other dredges of the same class, the Civil Works Directorate of OCE alerted Engineer districts and canvassed crews for volunteers. Hence, when Admiral Husband requested another hopper dredge in November 1966, OCE was ready to send the *Hyde*, which in January 1967 departed from Jacksonville, Florida, for Vietnam.

In addition to the *Davison* and the *Hyde*, the dredge fleet ultimately included 18 smaller pipeline cutterhead dredges, which were used primarily for land-fill work.

Dredging was imperiled by enemy attack and buried marine mines. The long supply line caused delays in getting replacement parts. These factors notwithstanding, the dredges in Vietnam cleared and deepened harbors, rivers, and canals; stockpiled sand for road and base camp construction; and reclaimed land for military sites.

Kenneth J. Deacon

Source: (1) Lieutenant General Carroll H. Dunn, *Base Development in South Vietnam, 1965 - 1970* (Washington, 1972), 52 - 54, 143. (2) F. C. Scheffauer, ed., *The Hopper Dredge: Its History, Development, and Operations* (Washington, 1954), ix, 3, 13 - 18 and Table II. (3) Memo, J. Remington, 16 Dec 1966. (4) OCE Items of Interest: Civ Wks Dir, Wks ending 19 Feb, 29 Apr, 23 Sep, 25 Nov 1966 and 20 Jan 1967.

Tulsa Responds in Peace and War

The history of the Tulsa District from 1941 to 1961 points up the flexibility of the district type of organization, which makes possible a quick transfer from civil works activities to military construction, civil defense, and disaster relief.

In late 1940, the Tulsa District included some 500 officers and civilian employees. With the transfer of Army Air Corps construction from the Quartermaster Corps to the Engineers in December of that year, the District got its first military construction projects—the Tulsa Aircraft Assembly Plant, Tinker Airfield at Oklahoma City, and Enid Army Airbase. The transfer of all remaining Quartermaster construction to the Engineers on 16 December 1941, nine days after Pearl Harbor, greatly increased the military construction load of an organization that only a year before had been concerned solely with civil works. The Tulsa District was now responsible for building cantonments, airbases, aircraft assembly plants, internment camps for prisoners of war and enemy aliens, ordnance plants, and military hospitals. During World War II the District supervised $800 million worth of military construction and procured equipment costing $100 million. The number of employees reached a peak of 3,250 in 1942.

In the years immediately after World War II, as military construction declined, the District again became almost wholly concerned with civil works. Just before the Korean War broke out in 1950, the District had a $17 million civil works program under way, with a military construction effort amounting to a mere $1 million. With the outbreak of war, the military construction effort again expanded, the District making the transition from civil to military construction rapidly and efficiently. From 1950 through 1953, the District supervised a military construction effort costing $150 million.

Military construction activities were also expanded occasionally in peacetime. In 1960, the District took on the crash program of building launching facilities for 12 Atlas ICBMs in the south-central United States. To provide protection against nuclear missile attack, the Tulsa District participated in the civil defense shelter survey program for the state of Oklahoma, entering into about 40 contracts with architect-engineer firms. About 4,500 buildings were surveyed.

The District on a number of occasions helped provide relief and assistance to areas stricken by natural disasters, easily taking in stride such added duties. In August 1947 the District was cited by the city of Tulsa for assistance rendered when the Arkansas River threatened to flood the Tulsa area. The District came to the aid of numerous communities when the Grand, Verdigris, and Red Rivers flooded in 1957 and 1959. It sent personnel to provide assistance during and after natural disasters, such as the California floods of 1955 - 56, the New England hurricane and floods of 1955, and Hurricane Carla in

1961. In Oklahoma, the scene of many tornadoes, District personnel provided crucial assistance to communities wrecked by the storms.

Karl C. Dod

Source: Ltr, Tulsa District Engineer to the Chief of Engineers, 11 May 64, sub: Civil Works Stùdy Board, w/incls.

Dust Control in Vietnam

Dust caused helicopters much trouble in the early days of the war in Vietnam. At that time it was commonly and fallaciously believed that the employment of helicopters would require comparatively little maintenance. It was found, however, that the whirling rotor blades generated huge clouds of dust when the choppers used unimproved areas, unsurfaced hardstands, or hardstands surfaced with pierced steel plank. Dust abrasion wore out rotors in as little as 200 hours and did much harm to carburetors and engines. By obscuring visibility, dust led to crash landings and collisions. In fact, dust put more helicopters out of commission than enemy action.

Upon returning home from a trip to Vietnam in December 1965, General Harold K. Johnson, Army Chief of Staff, expressed serious concern over the problem to Lieutenant General William F. Cassidy, Chief of Engineers, and Lieutenant General W. W. Dick, Jr., Chief of Research and Development. General Cassidy soon came up with a solution. Since World War II civil works laboratories of the Corps of Engineers had tested hundreds of materials for alleviating dust and stabilizing soil. Among other measures, Cassidy advised applying peneprime, a high penetration, medium-cure, cut-back asphalt product as a dust-proofing agent.

In addition, Cassidy, suggested the formation of a team of experts from OCE, the Waterways Experiment Station, and Army Materiel Command. The team went to Vietnam for two weeks in February-March of 1966.

After interviewing a number of high-ranking engineers, the team made field inspections in the II and III Corps areas, visiting sites where engineers were constructing roads, airfields, and helicopter landing zones. From the information obtained from the engineer commanders, the team made several recommendations for alleviating the dust problem. The report gave first priority to controlling the dust at helicopter landing sites, especially if tactical operations were being planned. It also indicated how much area around a landing site should be dust-proofed and what combinations of asphalt and oils might be used as expedients until sufficient peneprime was

available. These recommendations and the use of peneprime eventually settled the dust problem, thereby significantly improving the safety and effectiveness of U.S. helicopter operations.

Kenneth J. Deacon

Source: OCE Dust Control Team Rpt, n. d.

POL Facilities in Vietnam

Petroleum, the life blood of modern war, is, in actual tonnage, the largest single item to be transported to a theater of operations. This is because armed forces in the field move and fight on oil. Fleets of motor vehicles, construction equipment, tanks, aircraft, and ships will become immobilized for want of gasoline or diesel fuel. In spite of this obvious fact, there were serious gaps in plans to provide adequate petroleum-oil-lubricants (POL) storage and distribution facilities for the American forces in Vietnam in 1965.

In earlier days, tank farms of three commercial oil companies—Esso, Shell, and Caltex—near Saigon adequately served the small military advisory parties. But these companies had neither the storage capacity nor the means of distribution to take care of the great number of troops during the build-up of 1965.

In September of that year, at the request of U.S. Army, Pacific, in Hawaii, the Department of Army formed a Petroleum Assistance Team to go to Vietnam and plan a petroleum distribution system to meet the requirements of the U.S. Army there. The team consisted of six members, three from the Quartermaster Corps and three from the Corps of Engineers. Had the team been summoned at the start of the build-up, much confusion and frustration might have been averted. The team left Washington for Vietnam on 30 September 1965. After their arrival in Vietnam, the members interviewed representatives of major commands and commercial oil companies, reconnoitered the existing POL systems, and surveyed sites where future construction of facilities was envisioned.

In its report to U.S. Army, Pacific, the team recommended the development of POL storage and distribution systems at Saigon, Cam Ranh Bay, Vung Tau, Nha Trang, Qui Nhon, An Khe, and Pleiku.

The team also studied the petroleum distribution system for U.S. forces in Thailand. Using the same investigational techniques as in Vietnam, it made recommendations covering permanent and tactical pipelines, tankage and dispensing facilities, and ship-to-shore and other dispensing systems to support U.S. Air Force operations.

Following briefings at Army Pacific Headquarters in Hawaii on 15 December 1965, the team completed its mission and its members returned home. The recommendations of the team were implemented in both Vietnam and Thailand.

Kenneth J. Deacon

Source: Mil Eng Div, T&MLE, OCE, Hist Sum FY 1966, based on: Rpts of DAPAT to CINCUSARPAC, sub: Petro Dist Sys, USARV, 17 Nov 65, and Petro Dist Sys, US Forces, Thailand, 4 Jan 66.

Rufus Putnam's Chandeliers: The Fortification of Dorchester Heights, 1776

Today's highly professional, combat-ready Corps of Army Engineers presents a striking contrast with the infant Corps of 200 years ago. At the outbreak of the Revolution, the American Colonies had no trained military engineers who could serve with forces in the field. To be sure, there was Richard Gridley, a gifted mathematician whose exploits at Louisburg in 1745 and 1758 had won him a commission in the British Army and who, as a surveyor and civil engineer, had come to be known as "the only gauger in America." When the first shots were fired at Lexington and Concord, Gridley was sixty-five. Although he was named Chief Engineer of the Army, his age precluded hard compaigning. Most of the early field fortifications were designed by practical men, artisans and mechanics, who were innocent of engineering knowledge. This situation triggered the complaint from blunt-spoken General Charles Lee that none of his so-called Engineers could tell a chevaux-de-frise from a cabbage garden.

Lee's remark was aimed at the likes of Lieutenant Colonel Rufus Putnam, a Massachusetts militia officer pressed into service as an Engineer. A millwright by trade and a self-educated man, Putnam made no pretense of being a trained technician. He had, as he put it, "never read a word on the subject of fortification," and he disclaimed any knowledge of "laying works." Nevertheless, his plans for improvised defenses at Charlestown and Roxbury in the summer of 1775 had shown a certain Yankee shrewdness that many of his fellow Americans found impressive. In March of '76, lacking bona fide Engineers, General Washington turned to Putnam for advice.

Anxious to force the British out of Boston, Washington asked Putnam if he "could think of any way" to fortify Dorchester Heights, overlooking the city. The task seemed impossible. Because the ground was still frozen, earthworks were out of the question. Put-

nam could do no more than promise to think the matter over and try to find an answer. Later that same afternoon, when he called to congratulate newly promoted Major General William Heath, he happened to see a book on Heath's table, Mueller's *Field Engineer.* Putnam borrowed the book, and the next morning, on opening it to the contents, spied the word "chandeliers," something he had never heard of before. He turned to the page and there was his solution: fortify the heights with moveable wooden parapets, which the French called chandeliers. That very night, work details carried out his plan.

Every schoolchild knows the rest of the story. When the sun rose the following morning, the British saw American cannon pointing down at them from the heavily fortified heights. Overnight, their position had become untenable. Within a few days, they evacuated Boston.

Insisting that "Providence" had guided him to the chandeliers, Colonel Putnam moralized: "Let infidels scoff if they will." Today's Army Engineers enjoy educational advantages that Putnam never dreamed of. Although help from on high is still welcome, the Engineers are now usually able to solve military problems on their own.

Lenore Fine

Source: Rowena Buell, comp., *The Memoirs of Rufus Putnam and Certain Official Papers and Correspondence* (Boston: Houghton, Mifflin and Company, 1903), 56 - 58.

Building the Atlantic Bases

Following the fall of France in June 1940, German U-boats were able to operate with great effectiveness from bases in Brittany and the Atlantic ports. They were boldly aggressive, and, despite the convoy system, sank mounting numbers of British ships. By mid-August 2.5 million tons of shipping had been destroyed. The situation was ominous; Britain's survival was at stake.

Britain had an immediate need for more destroyers; the United States required strategically placed air and naval bases to defend the Panama Canal and the Atlantic coast as part of its Hemispheric Defense Plans. Accordingly, on 2 September 1940, the United States agreed to transfer fifty overage destroyers to Britain in exchange for the right to establish, under a 99-year lease, air and naval bases in the Bahamas, Jamaica, Antigua, St. Lucia, Trinidad, and British Guiana. Base rights for Newfoundland and Bermuda were also granted as a free gift to the United States at the same time.

This "destroyer deal," as it was popularly called, bolstered Britain in her desperate hour and enhanced the defensive posture of the United States.

Military organizations demonstrated their ability to work fast in an emergency. On 3 September a board of Army and Navy officers under Rear Admiral John W. Greenslade, USN, flew to Bermuda to investigate sites for bases. Colonel Joseph D. Arthur, Jr., served as Engineer adviser. By the end of October the board had surveyed sites in each of the territories.

Meanwhile, the Chief of Engineers, Major General Julian L. Schley, organized the Eastern (later Caribbean) Division, under Colonel Arthur, and four new districts—Newfoundland, Bermuda, Jamaica, and Trinidad—to direct base development. The Chief also established area offices in the Bahamas under the Jamaica District, and at Antigua, St. Lucia, and British Guiana under the Trinidad District.

In mid-February 1941, some two months before the State Department had completed negotiations with British and colonial authorities, the District Engineers negotiated contracts with American firms which would do the actual work. The contractors hired skilled American workers and paid them the same wages they would receive in the United States plus a differential for overseas service. Most of the common labor was locally hired and paid at prevailing rates. Seventy-five percent of the construction materials came from the United States. The Corps of Engineers exercised jurisdiction over all construction workers.

To avoid excessive expansion of their staffs, the District engineers engaged architect-engineer firms to aid in the design of airfields, housing, hospitals, and storage facilities. These firms designed buildings to conform with local architectural styles and to suit the particular climatic conditions at each base. Temporary housing was erected for the contractors' work force; more durable buildings were put up for the American garrisons. The Surgeon General appointed military personnel to staff the hospitals.

The airfields were ready when the United States went to war in December 1941. They permitted operations by heavy bombardment groups and interceptor aircraft. They controlled the approaches to the Caribbean and hence to the Panama Canal. The base at Newfoundland formed a vital link in the transatlantic ferry route to Britain; those at Trinidad and British Guiana formed stepping stones on the 2,000-mile flight from Puerto Rico to Belem, the most northern base in Brazil capable of handling heavy traffic.

Kenneth J. Deacon

Source: (1) J. D. Arthur, Jr., "Military Construction in the Atlantic Bases," *The Military Engineer,* 36 (September 1944), 390 - 93. (2) S. Conn, R. C.

Engelman, and B. Fairchild, *Guarding the United States and Its Outposts* (*U.S. Army in World War II* series) (Washington 1964), chs. XIV & XV, passim. (3) S. E. Morison, "History of U.S. Naval Operations in World War II," vol. I, *The Battle of the Atlantic, September 1939 - May 1943* (Boston 1959), 22 - 25, 33 - 36. (4) W. F. Craven and J. L. Cate, eds., "The Army Air Forces in World War II," vol. I, *Plans and Early Operations, January 1939 - August 1942* (Chicago 1948), 121, 124, 162, 320.

End Runs Toward Lae

During the Second World War, General Douglas MacArthur commanded both American and Australian forces in the Southwest Pacific Area. That is how a detachment of the United States 532d Engineer Boat and Shore (EB&S) Regiment happened to be attached to September 1943 to the 9th Australian Division for operations against the Japanese stronghold of Lae in northeast New Guinea.

Plans called for two Australian divisions to envelop Lae. On 6 September the 7th Division was flown from Port Moresby to Nadzab, just occupied by Allied forces. From there it marched easterly toward Lae.

Two days before, the 9th Division had made an amphibious assault on the shores of the Huon Peninsula, 16 - 18 miles east of Lae. The division then had to move over a coastal plain cut by five major rivers and covered with jungle interspersed by mangrove swamps and patches of kunai 8 - 10 feet tall.

The monsoon rains that began on the night of the 6th soon immobilized the vehicles. Troops had to carry supplies on bush litters and on their backs. Although 25 percent of the division's fighting strength was soon devoted to porterage, progress was slow.

On the 8th the 9th Division reached the broad Busu River that was a serious obstacle to reaching Lae. The next day men of the 2/28th Battalion, 24th Brigade, attempted to wade and swim across the mouth of the wild, rain-swollen river. Many of them were swept off their feet and carried to the west bank where they struggled ashore. Others were swept out to sea, drowned, or were marooned on a sand bar exposed to Japanese fire. Much suffering and loss of life might have been averted had the engineering implications of the assault been earlier recognized.

At this juncture, the detachment of the 532d EB&S Regiment, which had been running supplies to subsidiary beaches, extended its operations to the beleagured force. After bringing in emergency supplies, the American boat commander, Lieutenant Henderson E. McPherson, volunteered to ferry the brigade beyond the river. For 48 straight hours his small boat shuttled troops along the coast to the rear of the Japanese outpost line. Braving hostile fire, turbulent seas,

and rocky beaches, this single boat made 40 trips to deliver 1,200 troops of the 24th Brigade safely west of the Busu.

The Busu behind them, the Australians pressed forward for the final assault on Lae. The Japanese now realized that their position was untenable and fled through the jungle toward the north coast of the Huon Peninsula. On the afternoon of the 16th, the Australian divisions occupied Lae. Although few in number, the U.S. Army Engineers at Lae enhanced the movement of friendly troops and helped to assure the success of this important operation.

Kenneth J. Deacon

Source: (1) OCE, GHQ, SWPA, Ann Rpt for 1943. (2) Hq, 9th Aust Div, Acct of Opns for Capture of Lae, 4 - 16 Sep 43. (3) David Dexter, *New Guinea Offensives (Australia in the War of 1939 - 1945* series) (Canberra, 1961), 254 - 56, 270 - 71, 275 - 76, 337 - 40. (4) John Miller, Jr., *Cartwheel: The Reduction of Rabaul* (*United States Army in World War II* series) (Washington, 1959), 202 - 207. (5) *Engineers of the Southwest Pacific*, Vol. IV, *Amphibian Engineer Operations* (Washington, 1959), 97 - 98, 105 - 10.

Showing What the Corps Can Do During a Crisis

From the Civil War to the end of the nineteenth century, the Corps of Engineers concentrated on river and harbor projects. Congress kept appropriations for seacoast fortifications small. But in 1898, on the eve of war with Spain, the Corps of Engineers skillfully mobilized its civil works organization for defense. In Baltimore, one of the nation's major commercial centers, the Corps hurriedly built gun emplacements for partially constructed batteries from the mouth of the Patapsco River to the Inner Harbor. Chief of Engineers Brigadier General John M. Wilson realized that in such a crisis the reputation of the Corps of Engineers was at stake. He urged Baltimore District Engineer Colonel Peter C. Hains to "show what the Corps of Engineers can do when an emergency arises for which the country is unprepared."

During the spring of 1898, crews worked double shifts using every available daylight hour pouring concrete and mounting guns to protect Baltimore's harbor. By June, the battery at North Point at the confluence of the Patapsco and Chesapeake Bay had eight platforms ready for 12-inch mortars. Closer to the Inner Harbor, the Corps mounted 8- and 12-inch high-power rifles at Hawkins Point and old Fort Carroll.

At the same time, Colonel Hains supervised the planting of mines in the harbor itself. The entire operation was shrouded with utmost

secrecy. Between 23 April and 12 May, workers placed explosives in the water. Hains had them arranged 400 feet apart in two lines on each side of the channel. Engineers kept the mines for blocking the middle of the channel ready on shore "to be promptly laid," Hains wrote Chief Wilson, "when danger is imminent - say after an enemy's fleet has arrived in the Chesapeake Bay."

Fortunately, the Spanish fleet never got that close. By July, the Spanish military had been crushed. But in the emergency, the Corps of Engineers' Baltimore District had effectively transformed its civil works structure to protect the populace. In August, Hains exploded the mines in the harbor in a dramatic fireworks display.

Harold Kanarek

Source: Harold Kanarek, *The Mid-Atlantic Engineers: A History of the Baltimore District of the U.S. Army Corps of Engineers, 1794-1974.*

CHAPTER 3
MEMORABLE ENGINEERS

The Many Roles of an Engineer: U.S. Grant III

Leadership ability and technical expertise have led Army Engineers into a variety of jobs. A noteworthy career was achieved by President Ulysses S. Grant's grandson, U.S. Grant III. A 1903 West Point graduate, he served in the Cuban pacification of 1906, the Punitive Expedition against Mexico in 1916, and the First World War.

In the 1920's he turned to civil works, serving first as district engineer in San Francisco. Then, beginning in 1925, as officer in charge of public buildings and parks in the nation's capital, Grant gained a reputation as one of Washington's "characters"—and, more important, as one of its ablest public servants. Impatient with fools and visiting firemen, he wore heavy underwear to work in winter so that he could turn off the heat in his office; unwelcome visitors soon fled to warmer regions. Freed of distractions, he carried out a large-scale reconstruction of the White House (despite Calvin Coolidge's reported complaint, "If it's as bad as you say, why doesn't it fall down?"), improved the Mall, and laid out Rock Creek and Potomac Parkway. As executive officer of the National Capital Park and Planning Commission, he led the fight for area-wide planning and an improved park system. During World War II, and for years afterward, he served as the commission's president.

Education and scholarship also claimed Grant's interest. He served as vice-president of George Washington University and as president of the Columbia Historical Society. His sense of history led him to form strong ties to preservationists in the capital and to head the nation's Civil War Centennial. For 40 years he was an important influence in shaping Washington. Still, he was best remembered as an Engineer-administrator. "I think," said the civilian who headed the planning commission's staff, "he had the highest standard of public service of anybody I've ever known."

Albert E. Cowdrey

Source: Albert E. Cowdrey, *A City for the Nation.*

The Engineer As Humorist: George H. Derby in San Diego, 1853

Among the many Engineer officers of diverse talents and skills, Lieutenant George H. Derby, who wrote delightful stories under the name of John Phoenix, stands out as both topographer and humorist.

In late July 1853, on the eve of his departure from San Francisco for San Diego, Derby went to the dining room of his hotel for dinner. He watched attentively as the hotelkeeper carved a roast of veal into small pieces, explaining: "There is but little of it and I want to make it go as far as possible."

"In that case," said Derby, "I'll take a large piece. I think I can make it go as far as anybody. I am going to San Diego."

At his new station, topographical engineer Derby took a back seat to humorist John Phoenix. While the engineer worked at improving the harbor, the humorist became a frequent contributor to the *San Diego Herald.* When Derby's work proved difficult, Phoenix told his readers that the frustrated engineer "was sent out from Washington 'to dam the San Diego River' and he informed me with a deep sigh and melancholy smile that he [has been damning it ever since]."

Dedicated to keeping his readers abreast of engineering developments, Phoenix informed them: "The report that Lieutenant Derby has sent to San Francisco for a lathe to be used in turning the San Diego River is, we understand, entirely without foundation."

Derby made his mark as both engineer and humorist. His explorations of the Colorado River and the California gold fields contributed to the westward advance of American civilization; and his comic wit amused and delighted many readers, including his avid admirer Mark Twain.

Frank N. Schubert

Source: (1) George R. Stewart, *John Phoenix, Esq.* (New York: Henry Holt, 1937). (2) John Phoenix, *The Squibob Papers* (1865) and *Phoenixiana* (1866).

The Engineer As Archeologist: James H. Simpson in the Southwest, 1849

Men of diverse interests and talents, Engineer explorers in the trans-Mississippi West made significant contributions to scientific knowledge as they probed the new country. Lieutenant James H. Simpson, while reconnoitering the little known canyonlands of western New Mexico during the summer of 1849, discovered the ruins of ancient Indian pueblos, large prehistoric communities of stone, mortar, and wood, incredibly assembled with only stone tools by their unknown builders. There, in the canyons called Chaco and de Chelly, were the material remains of an Indian culture now known to be at least a thousand years old.

In a ten-mile strip of the floor of Chaco Canyon, Simpson found twelve large communal houses, each capable of housing several hundred to a thousand people, as well as many smaller structures. Delighted with his discovery, Simpson moved eagerly from one pueblo to another, visiting the accessible rooms, counting, measuring, and recording their contents. Farther west, in Canyon de Chelly, he again made dramatic discoveries. Here he found the ruins of still more large pueblos, including the one he called Casa Blanca because of its conspicuous wall of white plaster.

Lieutentant Simpson's discoveries, which were of lasting scientific importance, propelled him to prominence as an archeologist and ethnologist. In a region then unknown to Anglo-Americans, he found two important prehistoric sites, rich in artifacts that told much about the lives of ancient aborigines. To this day, nearly all accounts of the pueblo communities begin by acknowledging his pathbreaking efforts. While pushing back the physical frontier, Lieutenant Simpson showed the way to new scientific and cultural horizons.

Frank N. Schubert

Source: (1) James H. Simpson, *Navaho Expedition: Journal of a Military Reconnaissance from Santa Fe, New Mexico, to the Navaho Country Made in 1849*, ed. by Frank McNitt (Norman: University of Oklahoma Press, 1964), 3, 43 - 45. (2) Zorro A. Bradley, *Canyon de Chelly* (Washington: National Park Service, 1973), 4.

Three Memorable Corps Civilians: Green, Williamson and Koonce

Today the Corps of Engineers combines civil and military talent in a way that is unique in the Government. A hundred years ago, however, the position of civilian professionals employed by the Corps

was uncertain at best. Some officers saw them as an unwelcome necessity, forced on the Corps by a shortage of military personnel. Then, toward the end of the nineteenth century, some exceptionally able civilians—and the officers who believed in them—helped to change the Engineers' outlook.

Bernard Richardson Green was a twenty-year-old graduate engineer in 1863 when he began work as a Civilian Assistant on the defenses of the New England coast. Here he met a man who was to transform his life—Captain Thomas Lincoln Casey of the Corps of Engineers. By 1877 Casey was a lieutenant colonel in Washington, with responsibility for a variety of projects, including the completion of the Washington Monument. Remembering his able young assistant, he sent for Green to help him. Together they redesigned and finished the long-neglected, half-built Monument. Then they went on to complete the State, War, and Navy (Executive Office) Building and to construct the Library of Congress. After Casey died in 1896, Green continued to maintain the library building but branched out as well, directing construction of the Natural History Building of the Smithsonian, the Central Public Library on Mount Vernon Square, and the Pennsylvania State Capitol in Harrisburg. A distinguished figure in Washington life, he became president of the Cosmos Club and a leader in urban planning and civic reform.

Like Green, Sidney Bacon Williamson met a gifted Engineer officer while working as a Civilian Assistant—in his case, Captain George W. Goethals. In 1909, ordered by President Theodore Roosevelt to take over construction of the Panama Canal, Goethals placed Williamson in charge of the Pacific Division with a staff of civilians. At the same time Goethals shrewdly put the Atlantic Division of his vast project into military hands and encouraged the competition that resulted. The United States was the real winner of the contest. His reputation established by four-and-a-half years of some of the most complex engineering work carried out at that time, Williamson went on to reorganize the Bureau of Reclamation, head many important projects, and ended his career as a full-time consultant to the Corps.

But not only civil engineers were finding a field for their talents with the agency. Outstanding among the lawyers who had joined the staff of the Chief of Engineers was North Carolina-born George W. Koonce. Working with Colonel Alexander Mackenzie, a future Chief of Engineers, Koonce codified the laws against obstruction of the waterways and drew up the Refuse Act of 1899. In future decades, this law would provide the Federal Government with its first effective tool not only to remove obstructions from the waterways but to regulate effluents for the sake of the environment as well. Additionally, the obstruction laws and the permit programs they engendered helped to make the Corps a regulatory as well as a construction agency. Koonce served the Corps well from 1886 to 1946—a sixty-year career hard to equal either for sheer length or for his many contributions to the growth and development of the Engineer mission.

In the early years of the Corps, the place of civilians had been in doubt and proper recognition not always accorded to their services. Green, Williamson and Koonce not only demonstrated what civilian professionals could offer the Corps but showed that the Corps could provide a rich and satisfying career to those who served it.

Albert E. Cowdrey

Source: (1) Albert E. Cowdrey, "Pioneering Environmental Law: The U.S. Army Corps of Engineers and the Refuse Act," *Pacific Historical Review*, 44 (Aug. 1975), 331 - 49. (2) Michael C. Robinson, "People in Public Works: Sydney B. Williamson," *APWA Reporter* (May 1978), 4 - 5. (3) "Memoir of Sydney Bacon Williamson," *Trans. ASCE*, 80 (Dec. 1916), 2151 - 56. (5) David McCullough, *The Path Between the Seas.*

Engineer As Steamboat Designer

Colonel Stephen H. Long, an Engineer officer famous for his exploration of the American West and for the survey and construction of early American railroads, also designed his own steamboat. In 1818, Long planned the building of the experimental craft, the *Western Engineer*, to transport himself and a task force of scientists, naturalists, and artists as far west as possible by water on their projected trip into the frontier. The result was a steamboat designed to navigate narrow, shallow, snag-littered channels of inland rivers. It contained a particularly strong engine to provide increased power for pushing against swift currents. Another novel feature was a paddlewheel built into the stern to reduce the danger of damage from snags. The boat had a seventy-five by thirteen-foot hull with the weight of the machinery carefully distributed to permit increased maneuverability in shallow channels.

Altogether the *Western Engineer* was anything but a typical steamer. In fact, when launched in May 1819, its appearance was fearful—"Huge, black, scaly, the gigantic serpent blasted steam from its gaping mouth as it thrashed down the Ohio River, white foam dashing violently behind." In order to protect the vessel from Indian attack, Long installed a bulletproof pilot house. In addition, he had a cannon mounted on the bow, placed howitzers along the sides, and armed the crew with rifles and sabres. The boat had a serpent-like shape to frighten any would-be attackers.

The *Western Engineer*, drawing but nineteen inches of water compared to the five or six feet of most steamboats, became the prototype of the western river steam vessels. In it, Long and his crew explored the Ohio River and ascended the Mississippi and Missouri

Rivers into Nebraska. On this journey, Long's *Western Engineer* traveled farther west than any steamboat ever had.

Harold K. Kanarek

Source: Leland R. Johnson, *Men, Mountains and Rivers: An Illustrated History of the Huntington District, U.S. Army Corps of Engineers, 1754 - 1974,* 17 - 18, 21.

Major General James B. McPherson: Engineer and Army Commander

One of the most striking characteristics of the Corps of Engineers during the Civil War was its ability to provide officers who could serve in almost any capacity, from building roads to directing staffs to commanding troops. Certainly the best example of this facility was Major General James B. McPherson. An 1853 graduate of West Point, McPherson worked on the defenses of New York Harbor and was Superintending Engineer of the construction of the Alcatraz Island fortifications when the Civil War broke out. He promptly returned to the East, where he aided in recruiting the U.S. Engineer Battalion.

In late 1861 he was transferred to the Department of Missouri. There he attracted the attention of then Brigadier General Ulysses S. Grant, on whose staff he served as chief engineer, Army of the Tennessee, at the capture of Forts Henry and Donelson and at the Battle of Shiloh (6 - 7 April 1862). For five months he was the Superintendent of Military Railroads for the District of West Tennessee, and managed, despite a shortage of equipment and constant guerrilla harassment, to keep the railroads open for Grant's forces.

From October 1862 onward he was constantly in the field, commanding first a brigade, then a division, and finally an army corps in the operations against Vicksburg. During the siege of the fortress, he frequently acted as his own engineer. His most arduous field service was in Major General William T. Sherman's Atlanta campaign, when he led the Army of the Tennessee. Now a brigadier general in the Regular Army, as well as a major general of volunteers, he frequently commanded Sherman's flanking column, participating in the actions of Resaca, Dallas, Kennesaw Mountain, the crossing of the Chattahoochee, and the battles before Atlanta.

Tragically, on 22 July 1864, he was killed in action. While hurrying to correct a faulty deployment of his troops, he encountered a party of Confederate skirmishers. Upon ignoring their order to halt, he was shot out of his saddle. McPherson, who had been chosen by

Sherman as his successor, and whom Grant expected to eventually become general-in-chief, was just thirty-six years old. Grant had named him and Sherman as "the men of whom. . .I feel indebted for whatever I have had of success," while Sherman called him "that bright particular star."

On 18 October 1876, members of the Society of the Army of the Tennessee unveiled an equestrian statue of their commander in a public square of Washington, D.C. It was a memorial to a man now almost forgotten, but one who clearly held the loyalty and the respect of his contemporaries.

Dennis S. Lavery

Source: (1) Lavery, "Army Engineers in the Civil War," (MS in Historical Division). (2) Bruce Catton, *This Hallowed Ground* (New York: Doubleday and Company, 1956), 344 - 45.

The Engineer As Cartographer: Lieutenant Gouverneur K. Warren's Map of the Trans Mississippi West

The Army Engineers have always been nation builders. In the days before the Civil War, their contributions to national development included railroad and wagonroad surveys and even exploration. And after every expedition came a map, showing the lay of the land, the courses of the waterways, and the precious wood, water, and grass that sustained travelers in unpopulated regions. But these maps, important as they were, were fragments, parts of the total picture of the trans-Mississippi West. In the year of 1854, when Commodore Matthew C. Perry was opening the ports of Japan to American trade, we still had no reliable map of the western domain.

All this changed over the next three years. The man responsible, Lieutenant Gouverneur K. Warren, was a lean, black-haired graduate of the United States Military Academy. Ordered to compile a map as part of the survey for a railroad route to the Pacific, Warren worked incessantly from 1855 to 1857. He found large gaps in the available data on the northern plains but filled them with information garnered during three expeditions that he led into Nebraska and the Dakotas. Henry L. Abbot, a fellow topographical engineer and future Chief of Engineers who knew Warren in those years, later recalled the industry and dedication Warren took to the great task: "the midnight hour," Abbot recalled, "often found [Warren] hard at work comparing and reconstructing his preliminary tracings or poring over the old reports for missing data."

And the effort was well spent. Warren's map, published in 1858, provided the nation with its first accurate and unified look at the vast western territories. Minor refinements still needed to be made: other Engineers were just then planning expeditions into uncharted reaches of the Colorado and Yellowstone Rivers. But the general outline of the West was now clear; a cartographic milestone was reached.

Frank N. Schubert

Source: Frank N. Schubert, "Vanguard of Expansion: Army Engineers in the trans-Mississippi West, 1819 - 1879" (MS in Historical Division).

Portrait of an Engineer: Defender of New York in 1814

Recent reports of vast underground bomb shelters in the Soviet Union have revived American interest in civil defense. Since 1961, the Army Corps of Engineers has been planning to defend the civil population against possible enemy attack. Corps involvement in activity of this sort goes back to the nation's early years.

From the start of the War of 1812, British warships plying the Atlantic captured American merchantmen, blockaded major ports, and raided towns and villages for supplies and prizes. A time passed, and despite stirring victories by the small American Navy, enemy squadrons stepped up their harassment. In 1813 they attacked Norfolk, sent troops marauding through nearby Hampton, bombarded Lewiston in Delaware, burned Maryland settlements on Chesapeake Bay, and landed almost 1,000 men on the North Carolina coast. The next year, British admirals extended their blockade along the entire eastern seaboard and launched amphibious assaults, not only grabbing a large chunk of Maine's territory, but also seizing and burning the U.S. capital and occupying Alexandria. Terror gripped the coast.

Recalling its capture by the British during the Revolution, New York—the nation's largest city—felt especially threatened. While British ships cruised just off Sandy Hook, New Yorkers turned to the Army for help. During most of 1813 and 1814, Brigadier General Joseph G. Swift, Chief Engineer of the Army and superintendent at West Point, directed the city's defenses. Until mid-1814, he concentrated on the harbor's permanent works.

In the summer of 1814, a reinforced British fleet appeared off New York. Fearing an amphibious attack from the north or east, the city's Committee of Defense asked Swift to take charge of emergency preparations. Quickly, he drew up a plan calling for two lines of field fortifications, one stretching along hilltops outside Brooklyn, the other cutting across Manhattan from the mouth of the Harlem

River to the Hudson. Then he began to implement the plan and called upon citizens for support. The response was overwhelming.

Between August and November, 38,000 people worked on the defenses. Carpenters and pharmacists, brewers and lawyers, butchers and college students, tailors and artists, free blacks and city officials—rich and poor rubbed shoulders in the trenches, wielding axes, shovels, and spades. Organized in parties of 1,200 - 2,000, often working from sun to sun, and singing to keep their spirits high, they built two lines of field defenses. Volunteers put in a total of more than 100,000 work days. People unable to work contributed money, food, tools—and over 5,000 fascines for the parapets.

Astride his horse Flim Nap, or out on the Engineer yacht, Swift oversaw all defense preparations. Before long, he was also plotting strategy, inspecting troops, and directing ordnance, artillery, quartermaster, and medical activities. In the event of a British landing, he intended to lead the main force to repulse them. Impressed by the strength of New York's defenses, the enemy chose easier targets to attack.

In gratitude for Swift's service, the Common Council declared him a benefactor of the city, showered him with gifts, and commissioned John Wesley Jarvis to paint his full-length portrait. After the war, to commemorate the Chief Engineer's heroic effort in their city's behalf, officials hung the painting in City Hall. Recently restored, it hangs there today in the Council Committee Room.

Charles E. Walker

Source: (1) Joseph Gardner Swift, *Memoirs*, 131 - 38, 173. (2) Swift, Report on the Defence of the City of New York, MS, New York Historical Society. (3) Proceedings of the Committee of Defense, 1814 - 1815, MS, NYHS. (4) Rocellus S. Guernsey, *New York City and Vicinity During the War of 1812.*

The Use of Civil Experience in Wartime: Gouverneur K. Warren at Gettysburg

By the summer of 1863, Major General Gouverneur K. Warren, United States Volunteers, had developed a keen eye for terrain. As a Topographical Engineer during the 1850's, Warren had led three exploring expeditions into Nebraska and the Dakotas. In addition he had produced the first comprehensive map of the trans-Mississippi West, an accomplishment that has brought him wide and deserved acclaim.

This talent for assessing terrain, nurtured in civil assignments before the secession crisis, stood Warren in good stead during the Civil

War. On the second day of the battle of Gettysburg, Warren saw that the hill called Little Round Top on the southern flank of the Union line was weakly defended. Right away he knew that a strong Confederate attack on the hill menaced the entire Army. To the west, on Seminary Ridge, Confederate General John B. Hood reached the same conclusion and sent a force to take the hill. When Hood's men arrived they found strong Union reinforcements already in place. After a sharp fight, the Confederates withdrew. Warren had beaten them to the hill and saved the day for the Union.

Frank N. Schubert

Source: Frank N. Schubert, "Vanguard of Expansion: the Army Engineers in the trans-Mississippi West, 1819-1879," unpublished manuscript on file in the Historical Division, OCE.

CHAPTER 4

RAPID RESPONSE: DISASTER RELIEF AND RECOVERY

Ill Winds: Hurricanes Camille and Agnes

For more than a century, victims of hurricanes have looked to the Army Engineers for crucial aid. Corps rescue work on the Gulf of Mexico dates back to 1875, when its workers at Galveston manned boats to save storm victims caught in raging waters off Fort Point. Engineer planning dates to 1900, when retired Chief of Engineers Brigadier General Henry M. Robert gave Galveston its first protection plan. Enactment in 1950 of a federal disaster relief program brought the Corps heavy responsibilities but also demonstrated the fitness of the traditional Engineer organization to cope with new tasks.

On 17 August 1969 Hurricane Camille crossed the Mississippi coast with winds of 201 miles per hour and a surge some 24 feet above sea level. In its path steel and concrete buildings, venerable homes, and deep-rooted oaks were simply obliterated. As the storm passed, Engineers swung into action. The New Orleans District did superb work south of the city and also assisted the Mobile District that was responsible for most of the work along the Gulf coast and inland. Mobile District officials sent civilian contractors into the devastated areas to clear roads. Engineer troops from Fort Benning, Navy Seabees, and Airmen from Keesler Air Force Base joined in. Aided by these forces, the District removed rubble, recovered bodies, cleared trees, freed 14,000 residential lots of debris for rebuilding, and dredged 12 million cubic yards of shoaling from Gulf harbors.

Hurricane Agnes was one of the most devastating storms to hit the nation's eastern seaboard in the 20th Century. Between 14 and 23 June 1972 more than 100 died as torrential rains and floods swept away homes, farms, and businesses. Property damage totalled over $3 billion. The Susquehanna, Shenandoah, and Potomac Rivers topped their banks. Wilkes-Barre was engulfed. The Baltimore District at once responded, dispatching survey and rescue teams to aid the beleaguered city. As recovery work got under way, 14 disaster

area offices were set up in a hard-hit four-state region. Soon workers with buttons proclaiming that "The Corps Cares" seemed to be almost everywhere. At the suggestion of Major General Richard H. Groves, North Atlantic Division Engineer, the Chief of Engineers set up a new district to handle disaster relief. In a busy three-month lifespan the Susquehanna District cleared debris, housed refugees, repaired homes, and helped to make the battered region livable once again.

In both crises, the Corps demonstrated its ability to mold military and civil elements—its own personnel, contractors, troops—into a unified force working for recovery. Military discipline insured speed of response. Decentralization aided the Districts' intimate knowledge of local problems and local contractors' capabilities. Decisions were made quickly. The nationwide Corps organization formed a pool of talent from which overburdened Districts could and did draw help. Flexibility, training, speed, unity—these factors in the course of 100 years made the Engineers an essential part of the nation's response to the ruin caused by hurricanes.

Albert E. Cowdrey and Harold K. Kanarek

Source: (1) New Orleans, Mobile, Galveston, Baltimore, and Susquehanna District histories. (2) Lucile T. Barrett, and Edward Sanchez, "Camille and the Engineers," *The Military Engineer*, 61 (1969), 407 - 409.

The Great Upheaval: the Alaskan Earthquake, 1964

The response of the U.S. Army Corps of Engineers to the Alaskan earthquake of 1964 was prompt and positive. On Good Friday afternoon, 27 March, a violent earthquake rocked 50,000 square miles of south-central Alaska. The intensity of the shock measured between 8.4 and 8.6 on the Richter scale, releasing twice as much energy as the quake that destroyed San Francisco in 1906. Only the low density of the state's population and the hour—5:35 p.m.—when schools were empty, business areas uncrowded, and tides low—prevented the death toll from exceeding 114. Property damage totaled more than $500 million. In downtown Anchorage the upheaval leveled the unfinished Four Seasons apartment building and two parking garages. An elementary school and several houses slid into Ship Creek Valley, settling on top of an Alaska Railroad warehouse. Businesses on three blocks of 4th Avenue sank 10 to 20 feet into the earth.

At nearby Seward, which was getting ready to celebrate its selection as an All-American city, floods destroyed the industrial areas and the port, including the southern terminus of the Alaska Rail-

road. Tidal waves also obliterated other ports along Alaska's southern coast. At Kodiak, a wave lifted the crab fishing fleet out of the harbor and carried the boats through the town. Canneries on the waterfront disappeared.

The Corps of Engineers, in association with the Office of Emergency Planning, moved quickly to help communities in distress. Though many of their homes were in ruins, employees of the Corps' Alaska District reported for duty immediately. Less than 10 hours after the calamity, Alaska District Engineer Colonel Kenneth T. Sawyer sent emergency teams in light aircraft to assess the damage. Within the next few days Colonel Sawyer established special project offices at Anchorage, Valdez, and Seward to administer contracts for debris clearance, demolition, and repairs to sewers, water supplies, communications, and power distribution systems. Chief of Engineers Lieutenant General Walter K. Wilson, Jr., organized an emergency disaster team of 65 engineers from the Walla Walla, Seattle, and Portland Districts to assist in the rebuilding program. Retired Engineer Brigadier General Benjamin B. Talley, who had experience in military construction in Alaska during World War II, did much of the restoration design as a contractor with a private engineering firm.

The first priorities were reopening highways and reestablishing essential water and fuel supplies. Toward these goals, the Alaska District let contracts quickly. Merely clearing roadways was an enormous task. As one bulldozer operator reported, "It took us twelve hours to cut through the biggest slide, and when we got through there was another just ahead." In Anchorage alone reconstruction expeditures averaged $1 million a month for the first year after the disaster. Racing against the calendar, the Corps managed to complete most important repairs before the Alaskan winter arrived. In addition, the Alaska District channeled most of the restoration work to hard-hit local businesses, providing employment to residents whose livelihoods had been disrupted.

Altogether the Corps spent over $110 million on salvage, rescue, and rehabilitation operations in Alaska. Once again the Corps had moved efficiently and quickly to assist people in desperate circumstances. To the earthquake victims the code name for the relief effort —"Operation Helping Hand"—seemed apt.

Harold K. Kanarek

Source: (1) "The Alaska Earthquake," *The Military Engineer*, 46 (July - August 1964), 246 - 50. (2) Federal Reconstruction and Development Planning Commission for Alaska, *Response to Disaster: Alaskan Earthquake, March 27, 1964* (Washington, D.C., 1964). (3) W. A. Jacobs, *The Alaska District of the Corps of Engineers, 1946 - 1974* (Elmendorf Air Force Base, Alaska, 1976), 97 - 104.

The Benefits of Military Training: Colonel Eugene Reybold and the 1937 Flood

During the 1937 floods on the Ohio and Mississippi Rivers, Lt. Col. Eugene Reybold, District Engineer at Memphis, used his military expertise to combat the record high waters. Reybold's district embraced the Mississippi and its tributaries from Cairo, Illinois, to the mouth of the Arkansas River. In January rain equal to half the normal annual precipitation fell on the Ohio Valley, causing record floods at every point on the Ohio River, and sending raging waters rushing down the Mississippi. The ground was frozen and the runoff rapid. The waters threatened Cairo and the valley below.

After many sleepless hours, Reybold drew upon his training at the Command and General Staff School and the War College to deal with the situation. He wrote an estimate of the emergency and organized a defensive position against the unpredictable and treacherous enemy. He called upon the St. Louis and Kansas City districts for boats equipped with radios and drew experienced flood fighters from all districts. The Commanding General of the 4th Corps Area in Atlanta supplemented the floating radio network with Army Signal Corps units equipped with field radios and telephones. Reybold had communications available for practically every mile of main levee in his District. Finally, he set up Red Cross Headquarters in Memphis to take care of the anticipated flood refugees.

From his command post in the District Office in Memphis, Reybold directed his forces against the approaching enemy. With accurate information available to him instantly, he was able to open the New Madrid Floodway with dynamite at just the right time, saving Cairo from devastation. There were many dark moments, but Reybold promptly learned of each and every weakness in the levees and quickly had them reinforced. "My military training," he later observed, "and similar training of countless Engineer Officers sent to my assistance had a lot to do with the safe passage of the greatest flood the lower Mississippi Valley ever experienced."

Harold K. Kanarek

Source: Ltr, Lieutenant General Eugene Reybold to Chief of Engineers, Major General Lewis A. Pick, 22 Dec. 1949, in The Chief of Engineers' Memorandum to the Secretary of the Army on the Hoover Commission Proposal to Transfer Civil Works from the Corps of Engineers (10 January 1950), 4.

"A Globe of Compression": Brigadier General Joseph G. Swift and the New York Fire of 1835

Beginning with the Johnstown Flood in 1889, the Army Corps of Engineers has had an official role in aiding victims of natural disasters. But long before the Corps as an organization rendered such service, Army Engineers as individuals lent a helping hand to fellow citizens in times of trouble. An early example of the Engineer as good Samaritan was provided by Brigadier General Joseph G. Swift, former Chief Engineer of the Army, during the great New York fire of 1835.

Fire broke out in lower Manhattan on 16 December of that year. Spreading rapidly, it soon swept the first ward, east of Broadway and below Wall Street, consuming houses, stores, the Merchants' Exchange, and the old South Dutch Church. The longer the fire burned, the more it grew and intensified. Firefighters were powerless to stop the blaze which threatened to devour the entire city.

Alarmed and desperate, officials turned to General Swift, a municipal hero since 1814, when he directed the city's defense against threatened British attack. At the time of the fire, Swift was retired from the Army and working as a civilian on harbor improvements for the Corps. When the mayor appealed to him to stop the flames from spreading, Swift proceeded to contain the blaze behind a line of demolished buildings. First he calculated how much gun powder would be needed to "shake down" a house without damaging neighboring properties. Then he directed the placing of the charges in such a way as to create "a globe of compression" when ignited. As the powder went off, walls toppled inward and houses collapsed in ruins upon themselves, leaving adjacent structures unharmed. A novelty at the time, this technique is now common practice in the urban demolition business.

At great personal risk, Swift set off charge after charge, arresting the fire's advance on 17 December and thus saving countless lives and millions of dollars in property. For the second time in two decades, he received the city's official thanks. And within a few months after the fire, Swift—ever the Engineer—was busy with plans for replacing the burned-out buildings with up-to-date fireproof structures.

Charles E. Walker

Source: (1) Joseph Gardner Swift, *Memoirs* (Worcester, Massachusetts: F. S. Blanchard & Co., 1890), 222, 270. (2) "New York," *Harper's Encyclopedia of United States History* (New York: Harper & Brothers Publishers, 1901), VI, 423 - 24.

Texas City Explosion

On the morning of 16 April 1947, the earth shook at Texas City, Texas. Shortly after 9:00 a.m., the cargo ship *Grandcamp* containing 2,400 tons of ammonium nitrate exploded killing almost the entire forty-man crew. The blast was so intense that vibrations were felt sixty-five miles away. Fires and explosions erupted throughout the grounds of the Monsanto Chemical Company. The heat from the fires then spread destruction all along the Texas City waterfront. Sixteen hours after the initial blast, a second ship loaded with ammonium nitrate, the *High Flyer,* exploded adding to the nightmare. In twenty-four hours, over 500 people had died and as many as three or four thousand more were injured.

Immediately after the first explosion, the Galveston District of the Corps of Engineers was on the scene coordinating relief operations. Galveston District Engineer Colonel D. W. Griffiths personally traveled to Texas City by boat and organized the rescue mission from City Hall. The first task was to get the fires under control and to evacuate the area. During the frenzy of activity, Corps personnel helped remove the dead and injured, drove emergency vehicles, set up kitchens for fire fighters, patrolled the water, and maintained an emergency radio communication network. Colonel Griffiths, recognizing the magnitude of the catastrophe, asked the Commanding General of the Fourth Army at Fort Crockett, General Jonathan M. Wainwright, for reinforcements. Fourth Army responded rapidly and worked with the Galveston District, local authorities, and the Red Cross to supply food and medicine and clean up the debris.

Once again the Army Engineers were prepared to meet a catastrophe of unparalleled magnitude. The Corps experience in flood relief and in wartime operations served the engineers well during this unique emergency. Though the disaster produced massive confusion, the Army Engineers with its decentralized organization effectively helped coordinate efforts to meet the needs of the victims of the Texas City harbor industrial fire. In the aftermath, the Engineers worked for many months cleaning up the waterway and harbor.

Harold K. Kanarek

Source: Lynn M. Alperin, *Custodians of the Coast: History of the United States Army Engineers at Galveston,* 254 - 57.

CHAPTER 5
BUILDING A BETTER AMERICA

Upgrading the Urban Environment: Rock Creek and Potomac Parks

One of the most beautiful areas in the Nation's capital is Rock Creek Valley which runs from north to south through the entire District of Columbia. In 1867, Major Nathaniel Michler, the first Army Engineer to head the federal government's Office of Public Buildings and Grounds, awakened interest in the Valley by proposing it as a new site for the White House. Praising the region's "primeval forest and cultivated fields, its rocks clothed with rich ferns and mosses, its repose and tranquility, its light and shade", he saw it as a refuge for the Chief Executive from the malarial river front and an unsightly marsh called the Potomac Flats.

When in 1884 the prominent Washington banker Charles Glover began to press Congress for money to develop Rock Creek valley as a park, he found allies in the Corps of Engineers. Chief of Engineers Brigadier General Thomas L. Casey headed the commission that bought the land. Development of the park began in 1901 under Colonel Theodore A. Bingham, one of Michler's successors. Bingham believed the park would provide fresh air and places of recreation for crowded city dwellers and serve as an "emerald setting for the beautiful city." Other engineers shared his vision, hiring famed landscape architect Frederick Law Olmsted, Jr., to create the basic plan of Rock Creek Park and building Rock Creek and Potomac Parkway to link the green areas together.

Meanwhile, the Engineers had transformed the unsightly Potomac Flats. Beginning in the 1880's they had dredged the river channel, dumping the spoil on the Flats, thus creating new land to the south of the Mall. To spread the spoil, Washington District engineer Major Peter C. Hains used methods developed in levee work on the Mississippi River. In 1897 Congress dedicated some 628 acres of reclaimed land, henceforth called West Potomac Park and East Potomac Park ordering that it to be "forever held and used as a park for the recreation and pleasure of the people."

Bingham himself provided Potomac Park with gardens and athletic fields. Under his successors, the Tidal Basin, planned and built by the Corps to flush the Potomac and so help prevent pollution, became the center of a nationally known beauty spot as the Engineers directed the planting of Tokyo's gift of Japanese cherry trees around the basin.

It is not surprising that names in the parks recall the Engineer contribution: Beach Drive in Rock Creek Park for Captain (later Major General) Lansing H. Beach who built it, and Hains Point at the southernmost tip of East Potomac Park for Hains, the engineer who raised it from the waters. The Corps' work in Washington shows what engineering can achieve in sensitive hands to provide improved health, recreation, and beauty for crowded city dwellers.

Albert E. Cowdrey

Source: Albert E. Cowdrey, *A City for the Nation.*

Captain William Ludlow and the Preservation of the Yellowstone Wonderland

Although recreation has only recently become a major part of the Corps of Engineers waterway program, involvement of Corps personnel in the preservation and enhancement of recreational opportunities goes back over one hundred years to Yellowstone's first days as the original national park. It goes back to a time of such rapid western development that the explorer's frontier actually overlapped the arrival of tourists in the West. In 1875, when Captain William Ludlow entered the Yellowstone wonderland at the head of a reconnaissance party, there were the sightseers, like harbingers of the future, carving their initials, scattering their rubbish, and breaking off pieces of rock formations.

Alarmed by what he saw, Ludlow spent most of his time pleading with visitors to respect nature's work. He stopped one woman, already poised with a shovel over a mound formed over thousands of years by the mineral deposits of a bubbling spring, just before she did irreparable damage. Even his frantic efforts were far from adequate. "Miracles of art," he wrote, "can be ruined in five minutes by a vandal armed with an axe, and nearly all the craters show signs of [this] hopeless and unrestrained barbarity."

Ludlow's exploration did not amount to much, but his efforts on behalf of the wonderland did. In his report, he proposed several ways to preserve the park. All the measures he suggested—calling in

the Army, letting troops patrol the land, and have the Engineers build roads—were adopted. Thanks to Ludlow, who provided the blueprint for saving the Park, Yellowstone remains among the crown jewels of America's scenic wonders.

Frank N. Schubert

Source: (1) EP 1130-2-401, Recreation Statistics, April 1973. (2) Kenneth H. Baldwin, *Enchanted Enclosure: The Army Engineers and Yellowstone National Park* (Washington: Historical Division, OCE, 1976). (3) William Ludlow, "Report of the Reconnaissance from Carroll, Montana, to the Yellowstone National Park, made in the Summer of 1875," *Annual Report of the Chief of Engineers, 1876.*

Emergency Power: the Nuclear Power Barge *Sturgis* in the Canal Zone

One of many ways the Corps of Engineers contributed to the development of new energy sources was through the joint Army–Atomic Energy Commission (AEC) effort called the Army Nuclear Power Program. A striking example of Engineer work under this program occurred during 1968 in the Canal Zone. A water shortage jeopardized both the efficient operation of the Panama Canal locks and the production of hydroelectric power for the Zone. Because of the increased traffic resulting from the closing of the Suez Canal and the Vietnam War, such vast amounts of water were required to operate the locks that the water level on Gatun Lake fell drastically during the December - May dry season and necessitated curtailment of operations at Gatun Hydroelectric Station. Serviced by plants with a combined output of approximately 100 megawatts, the Zone had insufficient reserve capacity to permit its largest generator to shut down without interrupting power supply to military or civilian consumers.

In this emergency the Army Engineers dispatched to Gatun Lake the world's first floating nuclear power plant, the *Sturgis.* Having a capacity of 10 megawatts, the *Sturgis* had been designed by the Philadelphia Engineer District and christened in 1964 in memory of Lieutenant General Samuel D. Sturgis, Jr., former Chief of Engineers, who had died on 5 July of that year. The Corps had trained the crew at Fort Belvoir. Towed from its home base at Gunston Cove on the Potomac River, the *Sturgis* was connected to the Panama Canal Company power grid and began producing electricity on 5 October 1968. To help out further, the *Andrew J. Weber,* a diesel-

fueled power barge of 20 megawatts capacity was deployed the following month.

These two barges not only contributed to meeting the Canal Zone's power requirements but also made possible the saving of vast quantities of water that otherwise would have been needed to operate the hydroelectric power station. The over one trillion gallons saved between October 1968 and October 1972 were enough to permit fifteen additional ships to pass through the locks of the Canal each day. The *Sturgis* and the *Weber* had demonstrated in this emergency an ingenious Engineer response both to an energy crisis and to the need for water conservation.

Kenneth J. Deacon

Source: Kenneth J. Deacon, "The U. S. Army Engineers—Pioneers of Nuclear Power" (Draft, 1975).

Energy for America: Charles Keller and Niagara Falls

The falls of the Niagara River are one of the great scenic wonders of the world. Nevertheless, until the 20th century Americans marred their beauty and damaged their potential as a source of power. Factories poured refuse into the river above the falls, and cheap hotels sprang up along the banks. Local governments parceled out the right to use the Niagara's water to mill owners, who diverted such quantities that the flow over parts of the Falls was reduced by as much as 8 1/2 inches. Though the mills were often grossly inefficient, mill owners, instead of making the best use of the water they already had, competed with one another to divert more. In 1895, electric power production began, increasing still more the demand for water.

An improvement in the region's appearance began in 1885 when New York State established a park above the Falls. In 1906 the Federal Government stepped in. Congress instructed the Secretary of War—and consequently the Corps of Engineers—to issue permits to users of the Niagara's water. The mission of the Engineers was to regulate diversion in order to protect the navigability of the river and the Fall's scenic grandeur.

Major Charles Keller was one of the men who did much to preserve the beauty of the Falls and bring about a more efficient use of the power resources of the Niagara River. As head of the Corps' Lake Survey, he began a systematic study of the region. Sixty-five gauges made available a wealth of information regarding the river's depth and flow to be used in judging the merits of applications for

permits to use the water. Through its regulatory power, the Corps was able to persuade utility companies to generate maximum energy without excessive use of water. After the United States and Canada set up the International Joint Commission in 1908, work on the river expanded as Keller and other engineers supplied technical information to assist both nations to make the best use of their common property. But greater efficiency was by no means the whole story. Hoping to see increased beauty accompany more effective use, Keller pushed for a national park to be laid out along the river, to be financed with permit fees paid by industrial users of water. Long after Keller left the Lake Survey and the Niagara region, he continued to work and write in behalf of his goals for the Falls and the river.

In time he became involved in energy matters on a much wider scale. During the First World War, as the demand for electric power soared, federal officials began to fear that power shortages would occur in the heavily industrialized Niagara region and in other areas as well. At the suggestion of Keller and civilian experts, Secretary of War Newton D. Baker created a Power Section in the War Industries Board, staffed largely by Engineer officers. In 1908, Keller became National Power Administrator, guiding a program aimed at assisting the war effort. Before Keller left for France to serve as Deputy Chief Engineer of the American Expeditionary Forces, he had time to help establish the policies which guided the future development of the American power industry. After the war, Congress reshaped the National Power Administration into the Federal Power Commission. Now a permanent part of the government, the Commission continued the work that Keller and others had begun.

Albert E. Cowdrey

Source: (1) Buffalo District History. (2) Charles Keller, "Electric Power During the First World War," *The Military Engineer*, 17 (1925), 372 - 77 and 462 - 68. (3) *ARCE, 1909,* 1, 939 - 41.

Combating Unemployment in the Great Depression

Recent emphasis on stimulating employment recalls the efforts of an earlier administration to put people back to work. The stock market crash of October 1929 and the great depression that followed confronted the United States with its worst domestic crisis since the Civil War. By 1933, when President Franklin D. Roosevelt took office, some thirteen million people, nearly 25 percent of the labor force, were jobless. Banks had failed, local governments had gone bankrupt, and thousands of hard-pressed souls had left home to

roam the country in the uncertain hope that life might be better somewhere else. Organized relief, still overwhelmingly private and local, was inadequate to deal with the pervasive human misery.

Calling for "action now," Roosevelt declared in his inaugural address: "Our greatest primary task is to put people to work." He proposed to treat "the task as we would treat the emergency of war." During the first "Hundred Days" of the new administration, a cooperative Congress authorized public works programs of unprecedented scale. Soon the public was struggling to decipher these acronyms: CCC for the Civilian Conservation Corps, which would put young men to work in the forests; PWA for the Public Works Administration, which would "prime the pump" with useful construction undertakings; and WPA for the Works Progress Administration, which would organize so-called "make-work" projects in virtually every community. In the ultimate success of these "alphabet agencies," the Army Corps of Engineers played a conspicuous role.

Engineer officers, trained for war emergencies and experienced in civil works, were "naturals" for key administrative posts. Along with hundreds of Engineer reservists who took command at CCC camps, dozens of Corps regulars served as New Deal soldiers. Among the most prominent were Colonel Philip B. Fleming, deputy administrator of Harold Ickes' PWA; Colonel Francis C. Harrington, who was Harry Hopkin's deputy and eventual successor in WPA; and Colonel Brehon B. Somervell, who headed WPA in New York City. Many Corps civilian employees were also enlisted as members of the work-relief recovery team.

A major combatant in the war against unemployment was the Engineer Department—the nationwide field organization for civil works. In the first two years of the New Deal, almost half a billion dollars was allotted to the Engineers. An organization in being, with a backlog of worthwhile projects, the Corps proved equal to the challenge. From scores of sites across the country, the call went out for workers. At Fort Peck Dam on the Missouri River, some 10,000 workers and their families flocked to the construction site. In 1935 the Corps employed 5,000 men on a tidal power dam at Passamaquoddy, Maine. The list of going projects grew steadily longer: the Bonneville Dam, the great hydropower project on the Columbia River; 14 flood control reservoirs on the Muskingum in Ohio; enlargements of the Chesapeake & Delaware and Cape Cod Canals; improvements to the Intracoastal Waterways; canalization of the Upper Mississippi; Washington National Airport; the Mount Vernon Memorial Highway; and many, many more. The program created some 70,000 jobs each year.

What these jobs meant to the needy at the time can be sensed from the words of one of them: "This was a godsend. This was the greatest thing. It meant food, you know. Survival, just survival."

The American people today are enjoying the lasting benefits of Corps projects undertaken forty years ago as part of the recovery efforts.

Lenore Fine and Harold Kanarek

Source: (1) *Annual Reports of the Chief of Engineers, 1934 - 40.* (2) Morton Sosna, "Army Corps of Engineers Civil Works 1918 - 1941," (MS in Historical Division). (3) Studs Terkel, *Hard Times: An Oral History of the Great Depression* (New York: Pantheon Books, 1970), 86.

New Life and New Hope: the Struggle for Economic Recovery in Hawaii

On 4 March 1933, millions of Americans clustered around their radios to hear President Franklin D. Roosevelt deliver his inaugural address. Despair born of the depression gripped the country. "This nation asks for action, and action now," Roosevelt told his audience, adding that he would seek from Congress "broad Executive powers to wage a war against the emergency, as great as the power that would be given me if we were in fact invaded by a foreign foe." Action followed quickly. To relieve unemployment, Congress adopted a broad program of public works. Throughout the 48 states and in the U. S. territories and possessions, the New Deal alphabet agencies had a significant impact.

In carrying out this program, the Army Corps of Engineers played a vital role, as their record in Hawaii demonstrates. In the islands, successive Honolulu District Engineers—Major Stanley L. Scott, Major Ralph G. Barrows, and Major Peter E. Bermel—served as directors of the Public Works Administration (PWA). PWA was designed to expand employment on public works. About half of the cost of these projects was to be paid by PWA and the other half by states and municipalities. Besides creating new jobs, PWA would stimulate the economy with increased purchases of cement, lumber, and steel. Local contractors would be kept afloat. The District Engineer office reviewed applications for funds and administered all construction on both federal and non-federal projects. Between 1933 and 1939, PWA money went to improve harbors at Honolulu, Kaunakakai, and Port Allen; expand water supply systems; and build homes, schools, roads, and bridges. Scott, Barrows, and Bermel advised local communities, helping them to receive their full share of federal funds as rapidly as possible. In fixing the minimum wages on its own projects, PWA influenced salaries in other industries as well and thereby raised the Territory's standard of living.

In April 1938 the Honolulu District also became responsible for directing the effort of the Works Progress Administration (WPA) in the islands. WPA was a work relief agency which employed thousands directly on construction, educational, and artistic enterprises. Major Bermel employed 3,000 WPA workers on roads, bridges, and airfield construction projects. Bermel's chief assistant was Major Herman H. Pohl who, as one newspaper put it, brought "his keen sense of justice and humanitarian propensities" to WPA administration. Notable achievements were the extensions of the Kalihi-uka and Mokauea Roads, and the building of airfield facilities at Homestead Field on Molokai, at Hilo Airport, Engineers of the Honolulu District helped to revive the economy of the islands and to bring hope to Hawaiians in a time of despair.

Harold K. Kanarek

Source: Ellen van Hoften, *History of the Honolulu Engineer District, 1905 - 1965* (Honolulu: U. S. Army Engineer District, Honolulu, 1970), 28 - 30.

Building the First Interstate Highway

In the popular mind, the Corps of Engineers has been closly associated with waterway transportation. Certainly navigation improvements have long been a major part of the Corps' civil works functions. The Corps has also played a significant role in railroad development. For example, it surveyed and laid track for the Baltimore and Ohio railroad, performed railroad explorations in the trans-Mississippi west, and played a part in the building of the Alaska Railroad. Moreover, few people realized that the Corps helped to build and maintain the first interstate highway in the United States.

In 1806 Congress authorized the building of a National Road west from Cumberland, Maryland. Until 1824 the Treasury Department supervised construction; then the Corps of Engineers assumed responsibility. Between 1824 and 1838, military engineers made surveys, located the right of way, and inspected the construction being done on the road west of the Ohio River. While much of the work on the road was torturous, backbreaking, and painfully slow, progress was steady. The road eventually was extended as far as Vandalia in south central Illinois, and soon became a bustling artery of east-west travel and commerce.

By the time the engineers took over supervision of the turnpike, the portion east of the Ohio River was almost impassable. In his Annual Report for 1831 Secretary of War Lewis Cass of Michigan expressed the fear that unless the road from Cumberland to the

Ohio River was repaired promptly "expensive and useful work will be ruined." Between 1832 and 1835, Chief of Engineers General Charles Gratiot assigned Lieutenant Joseph K. F. Mansfield and Captain Richard Delafield to oversee the repairs. In many places the old road bed was so bad that the engineers had to start from scratch. Stone had to be crushed by hand, drainage culverts dug, and trees removed. But by the end of 1835, the road was in fine shape. The states through which the highway passed assumed responsibility for its management, including the collection of tolls to provide funds to keep it in proper repair.

The building and repair of the Cumberland Road through rugged mountainous country was a tremendous feat for the Corps of Engineers. The roadway connected the Atlantic coast to the hinterland. After World War II, the federal government incorporated the Cumberland Road into U. S. Route 40 to form an ocean-to-ocean highway.

Harold K. Kanarek

Source: (1) Forest G. Hill, *Road, Rails and Waterways: The Army Engineers and Early Transportation* (Norman: University of Oklahoma Press, 1957), 23, 37 47, 220 - 21. (2) Thomas Brownfield Searight, *The Old Pike*, ed. by Joseph E. Mores and R. Duff Green (Orange, Va.: Green Tree Press, 1971), 4, 19. (3) Harold Kanarek, *The Mid-Atlantic Engineers: A History of the Baltimore District of the U.S. Army Corps of Engineers, 1794 - 1974*, 35 - 42.

CHAPTER 6
RAILROADING IN PEACE AND WAR
The First Mile: Army Engineers and the B&O

The Army Corps of Engineers contributed to the development of America's first successful passenger railroad, the Baltimore and Ohio. The General Survey Act of 1824 provided the legal basis for the Corps' railroad work by authorizing the Secretary of War to assign Army Engineers to help with internal improvements. Two years later, Engineers made their first railroad survey, for a proposed line connecting the James, Roanoke, and Kanawha Rivers in Virginia, but private interests failed to develop the route.

Not until 1827 did the Corps really get a railroad on the way. In February of that year, answering a request from the recently chartered Baltimore and Ohio, Secretary of War James Barbour directed Army Engineers to survey possible routes from Baltimore across the Appalachian Mountains to the Ohio River. Major Stephen H. Long, an Engineer veteran of three western explorations, and Captain William G. McNeill, an artillery officer on detail with the Corps of Topographical Engineers ("Topogs"), led the initial surveys. After examining many routes westward through the rolling Maryland countryside, they decided the best way to go was through the valley of the Patapsco River, thence in the direction of Linganore Creek to Point of Rocks, Maryland, where the Potomac River flowed past Catoctin Mountain. The company approved this route.

On the Fourth of July, 1828, ninety-year-old Charles Carroll of Carrollton, the last surviving signer of the Declaration of Independence, helped lay the cornerstone of the B&O. Three days later Army Engineers started surveying the entire route from Baltimore to the Ohio River. Meantime, the railroad company sent McNeill and Lieutenant George W. Whistler, another artilleryman on topographical duty, to England to study locomotive and track construction. After returning home in 1829, they served with Long on the B&O's board of engineers and helped direct the building of the line to Ellicott Mills, 14 miles from Baltimore. Whistler personally supervised the laying of the first mile of track. By 1830, the line to Ellicott Mills was

in operation and the B&O was rolling toward prosperity. A bold new venture had been born with the help of Army Engineers.

In 1834, the B&O reached Harpers Ferry; and the next year the company opened a branch line to Washington, D.C. By 1842, the track stretched to Cumberland, Maryland; in 1853, it crossed to Wheeling, Virginia; and four years later, over connecting roads, it opened service to St. Louis. By the time of the Civil War, the B&O had become the major railroad joining the Atlantic seaboard to the growing Ohio Valley and points farther west. Even today, its centrally located route—first surveyed and built by Army Engineers—retains a prominent place in the country's railroad network.

Harold K. Kanarek and Charles E. Walker

Source: (1) Harold K. Kanarek, *The Mid-Atlantic Engineers: A History of the Baltimore District of the U. S. Army Corps of Engineers, 1794 - 1974.* (2) Forest G. Hill, "Government Engineering Aid to Railroads Before the Civil War," *Journal of Economic History*, 11 (Summer 1951), 235 - 46. (3) Ellis L. Armstrong, ed., *History of Public Works in the United States*, 134 - 35.

The Moosegooser's Route: Uncle Sam's Alaska Railroad

In the debate over federal support of the nation's railways, both sides have overlooked the Alaska Railroad—a successful 500-mile line owned and operated by Uncle Sam for over a half-century. Few outside Alaska know about this unique rail system; and fewer still know that the Army Corps of Engineers contributed measureably to its development.

In 1912, when President William H. Taft created the Alaska Railroad Commission to study rail transport in the territory, he chose as its chairman Major Jay J. Morrow, the District Engineer at Portland, Oregon. Two years later Congress, acting on Morrow's advice, authorized construction of an Alaskan railroad. President Woodrow Wilson promptly selected a north south route and got work underway.

Construction took eight years and cost $65 million. Army Engineers directed the final, post-World War I, phase. In the early 1920's, Colonel James G. Steese and Major John C. Gotwals, serving as members of the Alaska Engineering Commission, oversaw completion of the 470-mile trunk line between Seward and Fairbanks. At the same time, Steese, acting for the Alaska Road Commission, purchased the old Seward Peninsula Railroad and began its rehabilitation, gradually reopening the line to service. In the mid-1920's, when

the Interior Department took control of the Alaska rail system, the Engineers bowed out of the operation.

Not until the eve of World War II did the Corps resume rail work in Alaska. In 1940, military observers noted that the Seward - Anchorage line was highly vulnerable to saboteurs and hostile aircraft. After looking into the problem, Colonel John C. H. Lee of the North Pacific Division proposed a cut-off from Portage to the warm-water port of Whittier. Allotted $5 million for the project, the Army Engineers completed the job in 18 months. Bypassing the Portage glacier, they cut through the coastal mountains, blasting three and one-half miles of tunnels, one of them 13,890 feet long. The cut-off almost doubled the rail system's freight-carrying capacity. "A life saver to Alaska," one federal official called the new line.

Also supporting wartime rail service in Alaska was the 714th Rail Operating Battalion, an Engineer unit until 1942. The 1,150 men of the Battalion helped construct the Whittier cut-off and 31 miles of branch lines from Fairbanks to nearby air bases. Meanwhile, teams from the Seattle District ran surveys through rugged terrain for a new line from Prince George, British Columbia, to Teller, on the Bering Strait. Because Allied fortunes improved in 1943, this line was never built.

The Alaska Earthquake, which rocked the state in March 1964, brought the Army Engineers into the picture once again. The quake inflicted heavy damage on the railroad—$27 million worth all told. Remarkably, the two long unlined tunnels, built by the Corps two decades earlier, survived intact.

The toughest railroad reconstruction job—at Seward's waterfront terminal, part of which had toppled into the sea—fell to the Alaska Engineer District. During the next two years, the District oversaw the building of new dock, warehouse, and yard facilities. When the work was completed, Seward had a new $11 million port and the railroad had a new dock capable of berthing two 600-foot vessels.

Today, the Alaska Railroad runs smoothly and profitably, though slowed somewhat in winter by moose on the tracks. Alaskans, who have a fondness for the line, know the passenger train as the "Moosegooser."

The Moosegooser is a source of pride to Army Engineers, who have helped to make Uncle Sam's Alaska Railroad a success.

Charles E. Walker

Source: (1) Edwin M. Fitch, *The Alaska Railroad,* 44 - 48, 61 - 65, 83 - 90, 263 - 85. (2) W. A. Jacobs, *The Alaska District, United States Corps of Engineers, 1946 - 1975,* 3, 18. (3) Karl C. Dod, *The Corps of Engineers: The War Against Japan,* 18 -19. (4) Ann. Rpts., Ch. of Engrs.

First to France: Railway Engineers in World War I

From its beginning, rail transportation was a field in which Army Engineers excelled. Not till World War I, however, did they get a chance to display their railroading ability on a grand scale.

Shortly after the U. S. entered the war in April 1917, the War Department organized nine new Engineer regiments for railway work. In early May, a recruiting office opened in New York City, with the slogan, "First to France—Join the Engineers." The rallying cry proved accurate. Major William B. Parsons, head of an engineering commission appointed to study conditions in France, became the first Army officer to land in Europe. The first unit called into active service was Company A of the 11th Engineers (Railway), which led the disembarkment of American regiments at Boulogne, France.

France posed great problems for railway engineers. The battlefront was hundreds of miles from the ports. Railroads, crowded with war traffic, were breaking down. The needs of the civilian population, the lack of equipment, and, in some cases, the lack of track caused much congestion. Combat was going on in a thickly settled and intensely cultivated part of the country where private property rights, road patterns, and communication lines made new rail construction difficult.

The Engineers worked on both standard- and narrow-gauge lines. Work on the former centered around ports and storage depots far removed from the fighting. In an eight-month period, the Engineers had 25,000 men working on 450 standard-gauge projects—tracks, terminals, machine shops, car-repair and coal-storage facilities, regulating stations, cut-offs, and freight yards. By May 1919, the Engineers had provided an additional 1,000 miles of standard-gauge track.

Light railway regiments, serving with the combat forces, worked on narrow-gauge lines in areas where fighting might erupt and needs changed rapidly as battle lines shifted. During the Cambrai offensive, the 11th Engineers and Canadian troops laid an average of 1.4 miles of track per day while working under fire and sustaining casualties. In the St. Mihiel, Chateau-Thierry, and Meuse-Argonne offensives, Engineers put down track in darkness and heavy fog. Within 24 hours, they laid a record 7,000 feet on one line, which on the nights of 4 - 9 August 1918 carried some 23,000 men to support the operations of the 82d Division. Later, during a two-day period, the 14th Engineers operated the trains which supplied rations for three divisions totalling about 75,000 men. All told, the Division of Light Railways and Roads, headed by Major General William C. Langfitt, built 538 miles of narrow-gauge track. General John Pershing, commander of the AEF, praised its record for having "seldom been equalled."

During the war, the Corps sent 60,000 railway troops to France. On Armistice Day, 900 officers and 32,000 enlisted men were still

working on various railroads. In the first weeks after the Armistice, the engineers reconstructed lines, rebuilt bridges, and laid connections across no-man's land, helping to reopen the first rail service between France and Germany since 1914. The new railway lines built by the Engineers in France, if laid end to end, would have stretched from Paris to Moscow. The work of the railway Engineers was a valuable contribution to Allied success. When the troops came home in 1919, the 11th Engineers—first to France—marched proudly in the great victory parade down Fifth Avenue.

Charles E. Walker

Source: (1) S. L. Scott, "Railways in the Theater of Operations," *The Military Engineer* (May - June 1930), 259 - 61. (2) *Historical Report of the Chief Engineer, Including All Operations of the Engineer Department, Allied Expeditionary Forces, 1917 - 1919* (Washington: Government Printing Office, 1919), 104 - 16, 280 - 88. (3) Leonard P. Ayres, *The War With Germany: A Statistical Summary* (Washington: Government Printing Office, 1919), 53 - 62. (4) *History of the Eleventh Engineers, United States Army* (New York: J. J. Little and Ives Company, 1927).

A Railroad for General Patton

On 12 August 1944, Colonel Emerson C. Itschner, Engineer of the Advanced Section (ADSEC), Communications Zone, European Theater of Operations (ETO), received the following message:

> General Patton has broken through and is striking rapidly for Paris. He says his men can get along without food, but his tanks and trucks won't run without gas. Therefore, the railroad must be constructed into Le Mans by Tuesday midnight. Today is Saturday. Use one man per foot to make repairs if necessary.

He realized that he had an immense job on his hands. He had to reconstruct a railroad 135 miles long, with seven bridges down, three rail yards badly bombed, track damaged in many places, and few watering and coaling facilities. He had 75 hours to do a job normally requiring several months.

The 10,500 ADSEC engineer troops then available were scattered throughout Normandy. They had to be notified, assigned tasks, and deployed with their equipment to sites between Folligny in Normandy and Le Mans, 115 miles southwest of Paris.

Itschner first flew over the rail net to select the lines that could be repaired fastest. The most direct route was ruled out because major bridges at Pontaubault and Laval were too badly damaged for quick

repair. He decided to use the double-tracked line between La Chapelle Athenaise and Le Mans.

The bridge at St. Hilaire-du-Harcourt that spanned the Selune River was the single most serious obstacle. The Germans had blown the south end from its abutment, dropping it into the river. The 347th Engineer General Service (GS) Regiment cut off the damaged end, jacked up the bridge, and rested it on a crib. It completed this arduous task in three days, many men going without sleep. When Major General Cecil R. Moore, Chief Engineer, ETO, and Itschner flew over the bridge site six hours before the deadline, they saw spelled out on the ground in white cement: WILL FINISH AT 2000. And finished it was.

The first trainload of gasoline left Folligny at 1900, 15 August and reached Le Mans on 17 August. Thirty trains carrying gasoline for Patton's Third Army followed at 30-minute intervals.

Even while the emergency work was pushed, the 322d Engineer GS Regiment began reconstructing the bridges at Pontaubault and Laval. When completed by the end of August, these bridges allowed the opening of a more permanent and serviceable line to Le Mans.

The efforts of Itschner's engineer troops helped speed the gasoline to Patton that his armored spearheads required to fuel their thrust across northern France and shorten the war in Europe.

Kenneth J. Deacon

Source: Abe Bortz, Charles W. Lynch, and Ralph Weld, "The Corps of Engineers: The War Against Germany and Italy," (MS in Historical Division).

A Stride Toward a National Railroad Network: the Pacific Railroad Surveys

From the first surveys for the Baltimore and Ohio Railroad in 1827 to the construction of the Alaska Railroad after World War I, the Corps of Engineers participated in the development of the national rail network. In 1853 a significant chapter of this long process began to unfold. At the behest of Congress, the Topographical Engineers took on the difficult task of selecting the best route for a railroad from the Mississippi River to the Pacific Ocean.

The seven expeditions that studied potential routes across the continent faced complex assignments. Each party was required to report on the numerous determinants of railroad construction, among them distances, grades, mountain passes, canyons, bridge sites, and tunnels. In addition, each survey had to consider natural resources, par-

ticularly timber, stone, coal, and water, all of them important for building and operating a railroad.

The surveying parties faced great hardships as they made their way westward. In the Northwest, members of Isaac I. Stevens' expedition endured slashing Rocky Mountain blizzards as they sought to examine railroad passes. Far to the south on the Llano Estacado, Captain John Pope and his men spent many days without water. And in eastern Utah, Captain John Gunnison and several of his assistants were cut down in a pre-dawn ambush by Paiute Indians.

In spite of the obstacles, the Topographical Engineers brought back a remarkable amount of information. Their thirteen-volume final report was a comprehensive record of the trans-Mississippi region's fauna and flora, geological structure and geographical features. The huge compendium, widely discussed in the daily press, popular magazines, and the streets and homes of America, is still well known to naturalists.

Although the Congress, divided as it was by sectional animosities, failed to agree on any one route, the surveys ultimately proved of great significance. When the first transcontinental railroad, the Union Pacific-Central Pacific from Omaha to San Francisco, was built after the Civil War, it followed the path surveyed by Gunnison's party after his death. Later lines also went along routes first examined by topographical surveyers. The Pacific railroad surveys were a major stride toward the establishment of a national railroad system that bound together farms and markets, resources and factories, and the growing nation.

Frank N. Schubert

Source: Frank N. Schubert, "The Army Engineers in the trans-Mississippi West, 1819-1879," unpublished manuscript on file in Historical Division, OCE.

CHAPTER 7
STRENGTHENING THE FREE WORLD
Rehabilitation in Greece 1947 - 49

The advantages of having a military - civilian Engineer organization in being were demonstrated when the United States decided to help Greece recover from the devastation of war.

Soon after the end of World War II, Greece was torn by a civil war between Communist guerillas and government troops. President Truman and Congress believed it was in the national interest to prevent a Communist take-over. To strengthen the anti-Communist forces a program of economic aid to Greece was developed under the auspices of the State Department. A Greece on the road to economic recovery would be less likely to fall to Communism.

President Harry S. Truman appointed Dwight P. Griswold, a former governor of Nebraska, as the administrator of the recovery program. Soon after his arrival in Greece in July 1947, Griswold reported on the extensive devastation he found. The State Department decided that the reconstruction and rehabilitation of roads, railroads, bridges, ports, and the Corinth Canal, one of the main Greek waterways, were of primary importance. Once the country's transportation system was restored and the ports were in operable condition, economic recovery would be more rapid.

The State Department received some 100 letters from construction firms interested in doing the work. The Department was, however, unfamiliar with doing construction and letting contracts and had no organization to do the job. It sent representatives a number of times to the Office of the Chief of Engineers to get information regarding such matters as the selection of contractors, the types of contracts that could be used, and the amount of the fee to be paid. The State Department concluded it would be unable to do the work because it did not have the know-how in dealing with contractors and had no organization to put into Greece. It asked the Engineers, who had a far-flung civil works construction organization, to do the work. The Secretary of State requested the Secretary of War to assume responsibility for the job. Assigned to the Corps of Engineers in late July 1947, it was scheduled to be completed within a year.

The Engineers set up the Grecian District with headquarters in Athens, with personnel to be largely drawn from divisions and districts, and entered into agreements with a number of contractors who formed joint ventures. In mid-August, Colonel David W. Griffiths, the new district engineer, some of his civilian employees and some of the contractors' employees, arrived in Athens. Actual reconstruction began in mid-September with the clearing away of debris from the harbor of Piraeus, the port of Athens. Soon work was under way on the reconstruction of other ports, the reconstruction of wrecked railroad bridges and tunnels, and on the upgrading of highways which had deteriorated badly. The Corinth Canal was being cleared of debris. Soon after arriving in Greece, Colonel Griffiths was given the additional duty of upgrading a number of airfields. All of this work had to be done rapidly and efficiently. As the Secretary of War wrote, "the War Department is on continual exhibition to the President, the Congress, the State Department and to Greece ... and other interested nations." Colonel George W. Marvin, the chief engineer of the U. S. Army Group advising the Greek Army in its fight against the guerillas, helped Colonel Griffiths by obtaining Greek Army units to provide security for men working on district projects.

About 900 miles of highway were reconstructed, three major ports rebuilt, railroad bridges and tunnels totalling some two miles were restored, and 10 airfields were upgraded. The Corinth Canal was reopened after about one million cubic yards of earth and debris had been removed. Actual construction time was about a year and a half, the overrun having been due mainly to guerilla attacks, unusually severe winter weather, and delays in getting supplies. Once again, the Engineer military - civil organization made possible the efficient accomplishment of a mission.

Karl C. Dod

Source: (1) Engineers in the Cold War, MS in Engineer Historical Division. (2) Historical Division, *Examples of Civic Action Undertaken by the Corps of Engineers in Overseas Areas,* 1974.

Building the ICBM Bases

In October 1957, the Soviet Union put the first satellite, "Sputnik", into orbit around the earth. The news created a sensation. The United States was unable to duplicate such a feat at the time. Simultaneously, the Russians announced that they had developed an intercontinental ballistic missile (ICBM) which could fly at a speed of 13,000

miles an hour and hit a target 5,000 miles away. Although much work had been done on missiles in the United States, there was now a great outcry for a fully developed system of ICBM's to counter the Russian threat.

The Secretary of Defense assigned to the Air Force responsibility for developing and constructing ICBM's, together with the bases from which to launch them. The Air Force requested the Corps of Engineers, with its nation-wide military-civil organization, to build the bases. Actual construction of the bases would be by contractors selected by the Engineers. Speed was of the utmost importance.

Initially, the districts in which the sites were located supervised construction. As the effort expanded, a coordinating group, called the Los Angeles Field Office (LAFO), under the command of Colonel Thomas J. Hayes, III, was set up on 15 July 1959 in the Los Angeles District. Further rapid expansion of construction required a much larger organization, resulting in the establishment of the Corps of Engineers Ballistic Missile Construction Office (CEBMCO) in August 1960 at Los Angeles, under the command of Brigadier General Alvin C. Welling. With a peak strength of some 30 officers and 500 civilians, CEBMCO had under its supervision all ballistic missile base construction.

Practically all of the personnel needed to staff the newly-established Engineer offices which supervised the construction of the missile bases came from existing divisions and districts of the Corps of Engineers. Employees of CEBMCO, for example, came from engineer installations all over the world, many of them being "old-timers" with the Corps. On leaving CEBMCO, employees were entitled to full re-employment rights in the organizations they had left.

Many Engineer districts, laboratories, and testing stations provided support for ICBM base construction. All the real estate needed for the missile bases was acquired by the Districts in which the sites were located. The Waterways Experiment Station (WES) at Vicksburg, Mississippi, undertook waterproofing studies and made recommendations regarding concrete materials. The Rock Island District provided information on protective coatings. Various division laboratories tested materials needed for foundation work. A soils team from OCE investigated several missile sites to determine the adequacy of the sub-grade. Expertise developed in boring tunnels on the Missouri River dams was applied on the ICBM silos. Many of the districts supplied inspection teams to check on the construction done by contractors. LAFO and CEBMCO, in their daily operations, used numerous standard Corps of Engineer manuals and existing engineer studies and reports.

Construction of the missile bases was highly successful. By the end of the year 1963, the superiority of the United States over Russia in missile strength was estimated to be four to one.

Karl C. Dod

Source: 1st Ind, CEBMCO to CofEngrs, May 64 on Ltr, CofEngrs to Div Engrs *et. al.*, 1 May 64.

Building the Base at Thule

The Korean War, with its accompanying international tensions, made necessary the building of air bases in regions where, a short time before, such construction would have been impossible. Probably the most spectacular job the Engineers had was the building of a base in northern Greenland which would help protect North America against attack from across the Arctic. During Christmas week of 1950, when United Nations forces were in full retreat in Korea, Secretary of the Air Force Thomas K. Finletter met with Lieutenant General Lewis A. Pick, the Chief of Engineers, to tell him of the need for an air base in northern Greenland. The need was urgent. By November 1951 an air base would have to be ready to take the largest planes.

Despite the almost insuperable difficulties such a job would entail, General Pick was confident it could be done. He informed Secretary Finletter: "If you can give us $1,000,000 today, $15,000,000 on January 15, and the remainder of $50,000,000 on February 1, we will build a base and have it operational by November 1, 1951, provided you are willing for us to spend that much money ... without any more assurance than my word for it that any of the equipment and materials ... will even be successfully moved to the site." With a vast military-civil construction organization at his command, Pick was confident he could keep his promise.

No time was lost in getting on with the job. Engineers and airmen selected a site at Thule in northern Greenland, some 900 miles from the Pole, and midway between Washington and Moscow. Within days, Pick assembled engineers in his office to prepare plans for construction and had selected a number of construction firms which agreed to form a joint venture to do the job. The contractors set up their main recruiting office in Minnesota, a part of the country where workers for Army and Air Force projects in northern regions had been recruited in the past. To supervise construction, Pick set up the Northeast District under Colonel Clarence Renshaw.

Transportation requirements were so large that even the biggest commercial companies could not handle them. Only the Army and Navy with their many types of vessels and landing craft would be able to put men and equipment ashore on Greenland's inhospitable coast. The Joint Chiefs of Staff gave Pick responsibility for the military aspects of the job. Major General Harry B. Vaughan was appointed Deputy Chief of Engineers for the operation. The Air Force

and the Navy would provide support on an interdepartmental support basis.

The first on-the-ground reconnaissances at Thule were made in February when the area was still shrouded in winter darkness. Plans for construction were developed in the spring and supplies and equipment procured. In early June the convoy of ships taking men and supplies to Greenland steamed out of the harbor at Norfolk, Virginia, sailed through seas of ice off Greenland's coast, and arrived at Thule on 9 July. A great variety of jobs were soon underway. Piers were put in to enable ships to unload faster. Roads were built, fuel storage was provided, barracks and supply depots were erected, and most important of all, the airfield was being built practically on schedule. In mid-October the Engineers turned the airfield over to the Air Force.

Thule, part of America's first line of defense in the Arctic had been built, under General Pick's direction, by the teamwork and cooperation of the military-civil organization of the Corps, the contractors, the Air Force, and the Navy.

Karl C. Dod

Source: Lewis A. Pick, "The Story of BLUE JAY," *The Military Engineer*, (July - August 1953), 278 ff.

CHAPTER 8
CIVIC ACTION

Building a Sports Field in Occupied Germany

In an educational program designed to give American personnel a working knowledge of German, to promote social contacts between Americans and Germans and to encourage German-American sports contests, Army-German advisory councils were set up in each Army military post, where problems affecting German-American relationships could be discussed openly and possibly solved on the spot.

In the village of Wilhelmsfeld at a town meeting, held in 1951, the citizens of the community discussed the need for a sports field and playground for the children and youth of the town. The land, a clearing in a forest near the village, was available, but the 22,000 marks needed for leveling the land and clearing it of tree stumps was far beyond the villagers' means. Officials of the village and members of the sports club presented their problem at a town meeting, requesting Army Engineer assistance.

In response to the townspeople's plea, personnel of the Engineer Field Service Center and the 77th Engineer Construction Battalion moved bulldozers and other heavy equipment into the forest clearing. The big earthmoving machines, tearing up tree stumps and pushing piles of earth, provided daily entertainment for the local people, who were accustomed to doing their earthmoving with picks, shovels, and wheel-borrows.

The completion of the sports field occasioned "great festivity." The local school children and the town choral society participated in the celebration, and various honors were bestowed on the engineers to the accompaniment of loud applause by the villagers.

Karl C. Dod

Source: E. P. Hanifan, "The Army Lends a Helping Hand," *The Military Engineer,* (July - August 1951), 279.

Aid for Earthquake Victims in Morocco

Shortly before midnight on 29 February 1960, the resort city of Agadir, Morocco, was wrecked by a 12-second earth tremor. Of the city's 45,000 inhabitants, 12,000 were either dead or missing, 5,000 were injured, and almost all survivors were homeless. When Moroccan officials appealed on 1 March to all nations capable of giving aid, the U.S. Ambassador at Rabat requested military assistance from American forces in Europe.

Engineers were among those sent. Shortly after noon on 2 March, the first plane load of equipment and personnel of Company A, 79th Engineer Battalion, stationed in Germany, was airborne. When the men went to work in Agadir on the morning of 3 March, they used no heavy equipment for fear of killing persons trapped in the rubble. Four pick-and-shovel teams dug out 28 survivors on the first day. French, Spanish, and Moroccan military teams dug in other sections of the city. The engineer water supply point produced about 1,000 gallons of potable water per hour for quake victims and U. S. personnel. In addition, the U.S. Navy Cruiser *Newport News* docked at Agadir prepared to furnish 25,000 gallons of water per day for refugee camps.

Late on 3 March, the Moroccan government decided to end the pick and shovel rescue operations and use heavy equipment. The basic plan was to raze the city completely and eventually rebuild it. The 79th Engineers were assigned the task of knocking down what remained of the city, leveling the rubble, and spreading disinfectants over the ruins.

Karl C. Dod

Source: D.J. Hickman, U.S. Army in Europe 1953 - 1963, (MS in Center of Military History).

Bridge Building in Tunisia

Engineer units stationed in various parts of the world have on numerous occasions undertaken what are known as civic actions; that is, they have participated in projects that benefited local populations and often have provided help when disaster struck.

In 1964, Company B of the 293d Engineer Battalion in Germany undertook a civic action in Tunisia. A flood in October of that year destroyed an important railroad bridge over which shipments of ore were made, shipments vitally important to the Tunisian economy. Seeking fast action, the Tunisian government turned to the United

States for help. An engineer from the 7th Engineer Brigade in Germany flew down on 12 November to inspect the site. Later that month the first American plane arrived bringing men of Company B and bridge parts. The engineers finished their work on 7 December, the same day the Tunisian railway engineers completed laying the rails. Two days later all work was finished. The bridge had been restored in less than a month after reconstruction began. The United States presented the bridge to Tunisia as a gift.

Karl C. Dod

Source: Edward B. Glick, *Peaceful Conflict*, 143 - 44.

Suspension Bridges in Afghanistan

Even in such a far away and, to Americans, little known country as Afghanistan, the Engineers have participated in projects for the benefit of the local inhabitants.

Footbridges across the swiftly flowing streams of densely populated eastern Afghanistan usually consisted of pieces of hand-made rope and sticks of wood. All too often the bridges collapsed, carrying people to their deaths. The governor of one of the eastern provinces asked the U. S. Agency for International Development (AID) to assist in putting in better bridges. Members of the local Engineer area office, who in the 1960's were supervising construction of a modern highway system in the country, set to work to design a standard footbridge that could be built almost entirely by local workmen using local materials.

The Engineers designed two variations of a suspension bridge using towers of local timbers resting on masonry abutments. The first was designed to sustain the weight of a loaded donkey every 10 feet. The second, only slightly different, was designed to carry pedestrians, animals, and small vehicles. The steel hangers that carried the wooden deck of both types of bridges would be hung from the two main cables stretching from shore to shore.

A Peace Corps volunteer supervised construction. A number of competent local masons and carpenters were available. Ample supplies of rock for the abutments were found along the river banks. The two main cables were first strung from shore to shore and construction on the bridge then proceeded from the near shore to the far shore. Members of the Engineer area office periodically checked the work. The first bridge cost less than $1,000 to build.

Construction was timely. Shortly before completion, a flood swept away the nearby old bridge. The new one suffered no damage. Just

before the old bridge was lost, the withered old man known as "the Cricket," who kept it more or less in a state of repair, fell to his death. The new bridge, like the old, was named the "Bridge of the Cricket."

The project, though only a minor one, received much favorable publicity. The Afghans were looking forward with confidence and enthusiasm to building more bridges.

Karl C. Dod

Source: Major Phillip D. Weinert, "Suspension Bridges in Afghanistan," *The Military Engineer*, 59 (1967), 108 - 109.

CHAPTER 9
ANECDOTES AND BRIEF ITEMS

The Working End of an Engineer

Brigadier General William L. Marshall, Chief of Engineers from 1908 to 1910, weighed some 300 pounds. A gifted raconteur, he had a delightful sense of humor. One of the stories he enjoyed telling was how he became Chief.

Summoned to the White House in the summer of 1908, he reported to President Theodore Roosevelt, who queried: "Do you want to be Chief of Engineers?"

"I have never asked for anything," Marshall replied. "I am a soldier, sir."

"Well," said the President, "I'm going to make you Chief if you can complete the 90-mile ride I'm requiring of all mounted colonels." When Marshall began to chuckle, Roosevelt demanded: "What are you laughing about?"

"Sir," said Marshall, "If you have a horse that will carry my 300 pounds for ninety miles, I guarantee to stay on top of him."

"That's just the trouble," Roosevelt shot back. "You're too fat. You should keep fit like I do. My aides and I pound the saddle five hours a day, when we can find time, in order to stay fit and be worthy of our Cavalry tradition."

Still chuckling, but in his most respectful tone, Marshall answered: "Mr. President, a cavalryman keeps fit by pounding the saddle. But an Engineer, you know, has to do most of his work with the other end of his body."

Bursting out laughing, the President dismissed Marshall and soon thereafter sent his nomination to the Hill.

Lenore Fine

Source: Lieutenant General John C. H. Lee, Notes on William L. Marshall, 19 Mar 53.

The Ability to Say "No"

Every year after General Douglas MacArthur's return to the United States from the Far East, the principal officers of his World War II command held a birthday dinner for him at the Waldorf Astoria in New York. Among those who attended was Lieutenant General Samuel D. Sturgis, former chief engineer of the Sixth Army in the New Guinea and Philippines campaigns.

At one of these dinners, soon after Sturgis became Chief of Engineers, MacArthur reminisced about his early years as an Engineer officer—his work in the Milwaukee District, his tour as commander of Company "M", 3d Battalion of Engineers, and the course in field engineering that he taught at Ft. Leavenworth. Then, turning to Sturgis, the old soldier said:

> Sam, always remember this: The Corps' fame is not the Panama Canal, the Washington Monument, the gigantic dams on the Missouri, flood protection and navigation on the Lower Mississippi and the Ohio, the wonder of its modern air base construction, and the like. What the Corps is most famous for is its ability to say "No" when "No" should be said.

Upon his return to Washington, Sturgis had a study made of the Corps' action on surveys since 1824. The facts bore out MacArthur's contention. In 45 percent of its surveys, the Corps had said "No."

Lenore Fine

Source: Lieutenant General Sturgis, Memo for Record, n.d.

Captain Meigs and His Great Water Kettle

The water that Washington, D.C., drinks today is still delivered in part by the Aqueduct built in the 1850's by Engineer Captain Montgomery Meigs. An unknown officer when Chief Engineer Joseph G. Totten chose him, Meigs brought pride, style and ability to his job. In Congress he lobbied so skillfully for the improvement that grateful District of Columbia residents gave him a silver water kettle to symbolize his victory. When Jefferson Davis, then Secretary of War and strongman of President Franklin Pierce's Cabinet, selected him to build the Aqueduct, Meigs flatly refused to give bond. "The security of an Engineer officer's commission and character," he told Davis, "is better than the bond of a civil agent." Davis agreed, and on this basis Meigs built the capital's water system.

Albert E. Cowdrey

Source: Albert E. Cowdrey, *A City for the Nation.*

On Professionalism

Insisting on the correct nomenclature, old Colonel E. E. Winslow used to remind young officers that the difference between "Engineer Corps" and "Corps of Engineers" was the same as the difference between a "beer bottle" and a "bottle of beer."

Lenore Fine

Source: Letter, Major General Julian L. Schley to Historical Division, 5 Sep 53.

Mark Twain's Myopia

As General Dwight D. Eisenhower used to say, hindsight is always 20-20. Foresight is something else.

Keen observer though he was, Mark Twain missed the target when he predicted failure for the Corps on the Mississippi. In his delightful and witty book, *Life on the Mississippi,* Twain had this to say:

> The military engineers ... have taken upon their shoulders the job of making the Mississippi over again—a job transcended in size only by the original job of creating it. They are building wing-dams here and there, to deflect the current; and dikes to confine it in narrower bounds; and other dikes to make it stay there ....
>
> They have started in here with big confidence, and the best intentions in the world; but they are going to get left. What does Ecclesiastes VII, 13, say? Says enough to knock *their* little game galley-west, don't it?

For those who flunked Sunday School, Ecclesiastes VII, 13 reads: "Consider the work of God; for who can make that straight which He hath made crooked?"

If Twain came back to life today and saw the Mississippi, he'd have to write a different version.

Or perhaps he might get off the hook by quoting one of his own aphorisms: "Prophecy—two bull's eyes out of a possible million."

Lenore Fine

Source: Caroline Thomas Harnsberger, ed., *Mark Twain at Your Fingertips* (New York: Beechhurst Press, 1948), 279 and 384.

Engineering for Posterity

Sound workmanship is an old Corps tradition. Witness the first major Engineer work for the nation's capital—Fort Washington on the Potomac. Ordering construction in 1815, Colonel Joseph G. Swift instructed Lieutenant Colonel Walker K. Armistead: "Let us have it done for posterity, or not at all." Armistead replied that he would build a fort "exceedingly strong, of the most durable materials, and executed in the best manner." After serving in the Civil War, the fort still stands today, a major tourist attraction and a regional landmark.

Albert E. Cowdrey

Source: Albert E. Cowdrey, *A City for the Nation.*

Telling it Like it Is

Some folks accuse Army Engineers of patting themselves on the back. If, at times, they do seem boastful, it may be because they have something to boast about.

At a convention of the American Historical Association in the late 1940's, Dr. O. J. Clinard, then our Corps of Engineers chief historian, was in a cocktail lounge with friends. After a few drinks, Clinard started extolling the glories of the Corps and was soon reeling off a list of Engineer "greats":

Sylvanus Thayer, "father of West Point"
John C. Fremont, "pathfinder of the West"
Gouverneur K. Warren, hero of Gettysburg
George W. Goethals, builder of the Panama Canal
Charles G. Dawes, vice president of the U.S. under Coolidge
Lucius D. Clay, post-war governor of Germany—

At that, a friend broke in: "Hold on, old buddy. Next you'll be telling us that Robert E. Lee and Douglas MacArthur—our greatest soldiers—were Army Engineers."

Clinard beamed.

"Go look 'em up," he said.

Lenore Fine

Source: As told to Lenore Fine by O. J. Clinard

How to Get Things Done in the Army

Most soldiers have heard one version or another of the flag pole story. Lieutenant General Samuel D. Sturgis, Jr., Chief of Engineers in the 1950's, had his own way of telling it.

As a lieutenant in the 1920's Sturgis served with the Horse Engineers at Fort Riley, Kansas. The Post Commander was a crusty old Cavalry colonel, a spit-and-polish officer and a bit of a martinet. His junior officers never dared laugh unless he laughed first.

At a staff meeting one morning the colonel reprimanded the Post Quartermaster because the parade-ground flag pole was not perpendicular. Then, pointing to Sturgis, he snapped: "Lieutenant, if I told you to put up a flag pole, and get it straight, how would you go about it?"

"I'd say: 'Sergeant, erect the flag pole'," Sturgis replied.

Dead silence.

Then, the colonel chuckled and the others joined in.

Lenore Fine

Source: Told to Lenore Fine by Lieutenant General Samuel D. Sturgis, Jr.

An Example of Good Leadership

In August 1917 Colonel Lytle Brown took command of the 106th Engineers at Camp Wheeler, Georgia. Brown, who later served with distinction as Chief of Engineers, had the reputation of being a brusque soldier and fine field commander. Because he felt that citizens had been drafted to become soldiers and not to be orderlies, he forbade his enlisted men to split and haul logs for any officer. Officers, he insisted, should gather their own firewood.

As good commanders should, Colonel Brown set an example for his unit. Every evening between five and six, he was a familiar sight at the woodpile, his pipe gripped firmly in his teeth, chopping firewood for his own use. His early upbringing on a Tennessee farm was evident in the skill with which he swung that important pioneer tool, the ax.

Colonel Brown took a particular interest in Lieutenant Bartley M. Harloe, the only other regular army officer in the regiment. When Harloe reported for duty, Brown asked him, "Where were you born and brought up?"

"In Brooklyn," Harloe replied.

"City bred," Brown exclaimed. "That is a hell of a background for

an Engineer officer. Do you know how to swing an ax?"

"A little," Harloe answered softly.

"Well," said Brown, "meet me at five o'clock every evening at the wood pile. You will need instruction."

During the cold winter of 1917, Lieutenant Harloe split logs under the careful tutelage of Colonel Brown. And, during those strenuous sessions, the Colonel taught the Lieutenant other things as well, impressing upon his young subordinate the high standards of performance expected of an Engineer officer.

Harold K. Kanarek

Source: Ltr, Colonel Bartley M. Harloe to the Chief of Engineers, 23 May 1964.

Only Make-Believe

Army maneuvers, which simulate real war, have given rise to many humorous stories. Military engineers, who pride themselves on their ingenuity, usually get a kick out of this one.

During maneuvers in Louisiana in 1941, an umpire decided that the enemy had blown up a bridge and flagged it accordingly. Henceforth, men and vehicles were not to use it.

A short time later, an Engineer lieutenant came up with his platoon, looked at the flag, scratched his head, and then began marching his men across.

"Hey," yelled the umpire, "can't you see that bridge is out?"

"Sure," the lieutenant answered, "I can see the bridge is out. Can't you see we're swimming?"

Lenore Fine

Source: Adapted from Dwight D. Eisenhower, *At Ease: Stories I Tell to Friends* (New York: Doublday & Company, Inc., 1967), 243 - 44.

Every Man in His Place

Lieutenant General Samuel D. Sturgis, Jr., Chief of Engineers from 1953 - 1956, was fond of categorizing people. For example, all

officers were either "on the job" or "on the make." Another way of grouping them was as follows:

First, the intelligent and industrious: the salt of the earth—beyond price.

Second, the stupid and lazy: relatively harmless to anybody.

And last, the stupid and industrious: the anathema of mankind.

Lenore Fine

Source: Conversation with General Sturgis, c. 1962.

One Man's Castle Is Another Man's Pen

The castle insignia of the Corps of Engineers symbolizes fortification, a traditional activity of military engineers. A stylized reproduction of the old Porte Chausee of the city of Verdun, the castle reminds today's Engineers of their military heritage and of the great military engineers whose heirs they are—men like Vauban, Carnot, and Brialmont. Over the years, many stories have arisen about the castle insignia.

This one dates from World War I.

During his first days in camp, a timid recruit kept trying to identify the various branch insignia. After about a week, he reported to his tentmates:

"I think I have most of them straight. The crossed guns are for the doughboys; the crossed flags are for the Signallers; the pineapple's for the Ordnance; and the corkscrew's for the Medics."

But the castle had him stumped.

"For the life of me," he said, "I can't figure out what that darned penitentiary stands for."

Lenore Fine

Source: Adapted from *The Military Engineer,* XV (September - October 1923), 450.

Up In Smoke: William Ludlow And The $50 Bill

Brigadier General William Ludlow, now almost forgotten, was one of the best known Engineer officers of his time. An 1864 West Point graduate, a Civil War hero, western explorer, hydraulic engineer,

military attache in London, and general in the Spanish-American War, his reputation for probity was second to none.

In 1883 he was granted a special leave of absence from the Corps to take the position of Chief Engineer of the Philadelphia Water Department for a 3-year period. There he helped lead the city's fight against both water pollution and political corruption. The following story illustrates his character.

A man whose factory required a great deal of water was accustomed to making frequent visits to the Water Department to ask for special favors. When he visited Ludlow for the first time, he found him very polite. Taking a $50 bill from his pocket, he handed it to Ludlow, who looked at it for a second and then, spreading it out on his desk, asked, "My dear sir, what is this for?"

"Oh," said the factory owner, "that's to buy cigars for the boys."

"I suppose," said Ludlow, "you're fond of the weed yourself?"

The factory owner, it seems, enjoyed nothing more than a good cigar.

"Allow me," said Ludlow, taking out a box of Henry Clay Specials, whereupon each man helped himself to a cigar and bit off the end.

Ludlow rolled up the $50 bill and holding it up to the gaslight, set it on fire; he then lit his own cigar, and turning to his visitor, said, "Permit me."

With two or three gasping inhalations, the startled man managed to get a light, keeping his eyes fixed on the burning bill. When the bank note had been reduced almost to ashes, Ludlow asked his visitor, "How do you like your cigar?"

It was said the man turned purple whenever the affair was mentioned and was only too willing to tell people what not to do when visiting the Water Department.

Albert E. Cowdrey

Source: *Engineering News and American Contract Journal,* II, (June 7, 1884), 291.

CHAPTER 10
HIGHLIGHTS AND SIDELIGHTS

The Camels and the Corps: Lieutenant William H. Echols's Reconnaissance of West Texas

The deeper one delves into the history of the Corps, the more one is amazed by the variety and scope of the Engineers' experiences. A current motion picture calls to mind one unusual and little-known episode, the short-lived experiment with camels. The movie "Hawmps" is a comedy, but testing the dromedaries, imported at the behest of Secretary of War Jefferson Davis for use on the frontier, was no laughing matter to Engineer Lieutenant William H. Echols.

Fresh out of the Military Academy in 1858, Echols led two reconnaissances through rugged, arid portions of Colonel Robert E. Lee's Department of Texas. With his supplies lashed to the backs of camels, Echols pushed into the Big Bend wilderness. Soldiers hated the hump-backs—they groaned, bit, spat, and stank—but Echols respected their toughness. "No such march as this," he wrote near Fort Davis, "could be made with any security without them." His efforts, among the earliest field tests of the camels, were nullified when the onset of the Civil War shifted attention from the frontier. The camels were turned loose to run wild, and Echols returned to tamer pursuits. Unsung and unknown, this young Engineer played a central part in one of the more novel chapters of the Corps' complex history.

Frank N. Schubert

Source: (1) William H. Echols, *Diary of a Reconnaissance of Country Between the El Paso Road and the Rio Grande River,* S. Ex. Doc. 1, 36th Cong., 2d sess. (2) Odie B. Faulk, *The U. S. Camel Corps, An Army Experiment* (New York: Oxford University Press, 1976).

The "Great Abstraction": the Corps and the Washington Monument

Americans are indebted to the Army Engineers for the present form of the Washington Monument. At the end of the Civil War, architect Robert Mills' monument was a mere stump on the Mall, abandoned by its builders 20 years earlier and ridiculed by Mark Twain as "the memorial Chimney" and "a factory chimney with the top broken off." Around its base pigs rooted and cattle grazed; shacks and boat hulks rotted at the nearby river's edge.

In 1872, Engineers of the newly-created Office of Public Buildings and Grounds drained the area, graded it, and surrounded it with a carriage drive. Then, in 1876, as part of the national centennial, Congress appropriated funds to complete the Monument. Lieutenant Colonel Thomas Lincoln Casey (later Chief of Engineers) examined the foundation and discovered it could not support the design shaft. "If liberality among the people had enabled the Monument Society to complete its work," dryly remarked one of Casey's officers, "something startling would have happened."

Aided by Corps civilian Bernard Richardson Green, Casey enlarged and strengthened the base. Since the architect had designed an obelisk, he next wrote to the U. S. ambassador to Italy to secure the correct proportions. Finding the original proportions in error, he redesigned for a height of 555 feet. He preserved the stark simplicity of the obelisk infuriating Gilded Age architects, devotees of gingerbread design, who termed the result "one of the blankest, meanest, ugliest, and most unmeaning piles that ever encumbered the globe." Hence the "great abstraction" on the Mall owed its classic form to the Engineers.

A fitting conclusion to Casey's work came on 6 December 1884, when he joined Green on a wooden platform atop the Monument. Bracing themselves against a winter gale, the two Engineers watched their foreman add the tip: a little pyramid weighing 100 ounces, the largest piece of aluminum yet cast in the New World. Engraved on it were the words: "Chief Engineer and Architect, Colonel Thomas Lincoln Casey, Corps of Engineers."

Albert E. Cowdrey

Source: Albert E. Cowdrey, *A City for the Nation.*

The Final Voyage of the U.S.S. Maine

The Army Engineers have had a long association with harbors and harbor improvements, but nothing in their history quite compares

with the unusual job assigned them in 1910—to raise the battleship *Maine* from Havana harbor.

On the hot, dark, still night of 15 February 1898, a mysterious explosion ripped through the forward magazines of the U.S.S. *Maine,* moored off Havana, Cuba, then a Spanish territory. The force of the detonation seemed to lift the 6,682-ton ship half out of the water, before sending its twisted and blackened mass to the bottom. With it went the lives of over 250 men and whatever hope remained for continued peace between the United States and Spain. The sinking provoked a bellicose outcry from Americans and galvanized them for a brief, victorious war that wrested Cuba and other colonies from Spanish control.

For a decade after the war, the *Maine* lay at the bottom of the harbor. Then, in 1910, Congress decided to raise the warship, and the Secretary of War assigned the task to the Corps of Engineers. Working under the direction of Major Harley B. Ferguson, the Engineers first built a large elliptical cofferdam comprised of twenty interlocking steel cyclinders, each 50 feet in diameter and containing about 150 piles. The cofferdam extended downward throught 37 feet of water and another 15 to 24 feet of soft mud, in which the *Maine* was mired.

Building the cofferdam took 11 months. While constructing it, the Corps had to cope with many difficulties: faulty equipment, poor weather, uncertain Congressional support, and annoying souvenir hunters. But by November 1911, the Engineers were ready to pump the water out of the giant cofferdam and expose the wreck. A court of inquiry then conducted an investigation which showed that the fatal explosion had come from the outside. Once the examination was over, the Engineers removed the remains of 60 men trapped in the sunken vessel and prepared the *Maine* for its final voyage.

In February 1912, fourteen years after the explosion, the Engineers refilled the cofferdam with water. The multilated hull broke free from the mud and floated. One month later, a tug towed the *Maine* to deep water beyond the three-mile limit. There the Navy gave the ill-fated battleship an "honourable burial beneath the waves."

Charles E. Walker

Source: (1) Jack Hammersmith, "The United States Army Corps of Engineers in the Spanish-American War," (MS in Historical Division). (2) Donald Barr Chidsey, *The Spanish-American War* (New York, 1971), 54 - 63. (3) Margaret Leech, *In the Days of McKinley* (New York, 1959), 163 - 80.

Where the Hens Laid Hard-Boiled Eggs: Lieutenant Derby at Fort Yuma

For Engineers as for other soldiers, service in the frontier Army often meant duty at remote and dreary posts. Fort Yuma, in the middle of a parched wasteland populated by unfriendly Indians, was such a place. Many soldiers and officers passed through the fort, but none more vividly described the desolation than the topographer and humorist Lieutenant George H. Derby.

An 1846 West Point graduate and a veteran of the Mexican War, Derby went to Yuma in 1850 while on an exploration of the Colorado River. Although he arrived in mid-winter, it was hot; the mean December temperature was a blistering ninety-two degrees. Referring to Yuma as the place where "hens lay hard-boiled eggs," Derby went on to spin the following yarn passed down to us by Mark Twain: "There is a tradition that a very, very wicked soldier died there once, and of course went straight to the hottest corner of perdition—and the next day he telegraphed back for his blankets."

Later, in one of his humorous essays on astronomy, published under the pen name John Phoenix, Derby had more to say about Fort Yuma. This time he considered the desirability of establishing a post in another inhospitable clime—on the planet Mercury:

> [Mercury] receives six and a half times as much heat from the sun as we do; from which we conclude that the climate must be very similar to that of Fort Yuma, on the Colorado River. The difficulty of communication with Mercury will probably prevent its ever being selected as a military post, though it possesses many advantages for that purpose, being extremely inaccessible, inconvenient, and, doubtless, singularly uncomfortable.

Derby accomplished much more than a memorable description of an isolated outpost. By proving that the Colorado River was navigable as far as Fort Yuma, he cleared the way for regular water-borne shipments to the post, thus insuring its continued service to the many pioneers who took the southern route to the Calfornia goldfields.

Frank N. Schubert

Source: (1) George R. Stewart, *John Phoenix, Esq., The Veritable Squibob* (New York: Henry Holt and Company, Inc., 1937), 71. (2) John Phoenix, *The Squibob Papers* (New York: Carleton, Publisher, 1865), 20. (3) John Phoenix, *Phoenixiana* (New York: D. Appleton and Company, 1856), 59.

Maps for NASA

In the late 1950's the probability that the National Aeronautics and Space Administration (NASA) would before long send men to the moon made it of the utmost importance that adequate maps be prepared for exploring this new territory. The astronauts would have to know which crater they were landing in and what lay beyond the horizon. Landing and lauching sites would have to be fixed precisely. Since the moon had no magnetic field, a compass would be useless, and a general idea of direction would in itself be of little help.

In 1958, the Army Map Service of the Corps of Engineers began to investigate the feasibility of preparing a topographic map of the moon at a scale of 1:1,000,000 based on telescopic photographs of the moon's surface. The engineer topographers concluded that reconnaissance-type photomaps at a scale of 1:5,000,000 were feasible. Such maps would show only the most general terrain features.

There would be great difficulties. The moon was a quarter of a million miles away, and photomaps of the earth were made from photographs taken at the most from a height of 6 miles. The usual technique of juxtaposing photographs taken from slightly different angles and viewing them in special stereoscopic equipment to get a three dimensional effect, necessary for determining the elevation of terrain features, was well-nigh useless because all pictures of any part of the moon taken from any point on the earth were practically identical. Another matter to be settled was the establishment of fixed references points on the moon by which explorers could determine the elevation, latitude, and longitude of the place where they were.

The topographers' first attempts to make a map failed. The moon was too far away and too big. Old photomapping techniques and equipment were modified and improved. New techniques were devised. A closed circuit television apparatus was developed to enable map makers to see lunar features under different conditions of light and shadow, which made it possible to determine with greater accuracy the height of various terrain features.

The lunar map the Army Map Service finally developed represented the visible surface of the moon at a scale of 1:5,000,000. Topographic features were shown with 1,000-meter contours, and in some cases with 500-meter contours. The map identified some 5,000 terrain features. Certain small areas were mapped in greater detail. Proposed NASA landing sites were mapped at a scale of 1:250,000 with color tints added to show the colors the astronauts were likely to see on approaching a particular site.

The topographers made rubber or plastic three-dimensional models of parts of the moon's surface to be used in connection with simulated landings, which the astronauts practised in NASA's experimental stations. The models were photograghed to indicate various altitudes and the resulting films were projected on large screens to

show how the moon would look to men riding past at such altitudes. A problem was to find a material on which to print maps which could withstand the moon's extreme temperatures ranging from 214 degress above to 250 degrees below zero and which could be folded to fit into an astronaut's pocket. Plastic and rubber compounds were developed in an attempt to find a solution.

Thus, the topographic engineers undertook a task of vital importance to NASA. Constant improvements were made in an effort to produce better moon maps. With photographic equipment subsequently installed in satellites orbiting far above the earth, the preparation of far better maps was possible.

Karl C. Dod

Source: T. J. Hayes, III, "Army Engineers Map the Moon," *Army Information Digest*, (January 1965), 12 - 17.

A Case of Mistaken Identity: the Groves That Moved

Appearances could be deceiving, even in the Platte River valley, which in 1842 was already known for its predictability. Through this treeless grassland so flat that only the curvature of the earth limited vision, Lieutenant John C. Fremont of the Topographical Engineers and his small exploring party rode serenely toward South Pass, the Rocky Mountain gateway to Oregon. But even the unchanging Platte valley had its surprises. When cartographer Charles Preuss saw three large groves of trees, he was indeed startled. Overcoming his astonishment, he reined in his mule and reached for his notebook. Here was a significant landmark for his map of the route. As he began to write, he got another surprise: the trees began to move. "My woods," said Preuss ruefully in his diary, "which would have looked nice on the map, turned out to be three immense herds of buffalo." The Platte valley held no surprises after all.

Frank N. Schubert

Source: Allen Nevins, ed., *Narratives of Exploration and Adventure by John Charles Fremont* (New York: Longmans, Green & Co., 1956); Charles Preuss, *Exploring with Fremont, The Private Diaries of Charles Preuss* (Norman: University of Oklahoma Press, 1958).

CHAPTER 11
QUOTABLE QUOTES

The Military-Civil Mission

"During the time when I was old enough to have an overall understanding of the Corps, I know that the Corps considered its principal functions to be: (1) a part of the combat team with the infantry and artillery; and (2) a construction agency capable by training and experience to handle major construction work needed in time of war and in preparation for war. Personally, I have always looked on the work on rivers and harbors, on the one hand, as an opportunity seized by the Federal government to make full use of a capable and honest body of engineers free from political influence; and, on the other hand, as a fortunate means for the Corps to learn how to handle large forces of labor, great amounts of construction materials, and big sums of money. A military engineer must have broad engineering experience between wars."

Major General Julian L. Schley, Chief of Engineers 1937 - 1941

Lenore Fine

Source: Letter, Schley to Historical Division, 5 Sep 53.

A Healthy Sense of Curiosity

Speaking to an Officers Candidate School graduating class at Fort Belvoir in the fall of 1942, Major General Eugene Reybold, the Chief of Engineers, offered this advice:

One of the best ways for an Army officer to keep on his toes is to cultivate a healthy sense of curiosity—an inquiring mind. Any good Engineer Officer must wonder about the problems of the

German Engineers in the assault on Stalingrad, and about the problems of the Russian Engineers in repelling that assault. Any good Engineer will never pass a bridge but what he gives a thought as to how that particular piece of terrain might best be organized for defense, or as to how it might best be attacked if it were organized by the enemy. I commend heartily to you the practice of setting up in your own minds hypothetical military situations suggested by things you encounter in everyday life.

Lenore Fine

Source: Address by General Reybold at Graduation Exercises, 15th Officers' Candidate School, Ft. Belvoir, 28 October 1942.

A Toast to the Eagle That Looks Like a Duck

Among the relics and trophies displayed in the Castle Room of Mackenzie Hall at Fort Belvoir is an old plaque bearing the crest of the Corps coat-of-arms. Crudely carved, the crest's eagle, wreath, and "Essayons" motto are the work of a long-ago enlisted man in the carpentry shop at Willets Point, New York. For years the crest hung over the entrance to the Engineer Mess at Willets Point, and it accompanied the Engineer School when it moved to Washington Barracks in 1901 and to Fort Humphreys (now Fort Belvoir) in 1919.

At Willets Point in the 1890's, the young officers attending the School irreverently dubbed the bird "the eagle that looks like a duck," and they pledged many a cup to the grand old fowl. Among the tipplers was Lieutenant Sherwood Cheney, who later became a distinguished general. One of "Sherrie's" toasts has come down to us and, in script too small to decipher, is affixed to the plaque in Mackenzie Hall. It is still worth drinking to:

Here's a health to the Army'
And here's a health to our Corps'
And here's to the Flag flying up on the hill
And the bird flying over our door'
Stand by, with your glasses all brimming,
Here's health, and here's how, and here's luck'
And here's to the Castles of Silver we wear,
And the Eagle that looks like a Duck'

Lenore Fine

Source: (1) *The Military Engineer,* 17 (July - August 1925), 359. (2) Information supplied by The Engineer Museum, Fort Belvoir.

The Importance of Civil Works for Military Engineers

Secretary of the Army Frank Pace, Jr.'s views (1952) as to the importance of Civil Works for military engineers:

> The proved benefits in World War II of the individual engineer officer-training afforded by participation in large-scale civil works programs were not limited to the superiority of our military engineering effort but were also evidenced by the dominant part which officers trained in this system played in the almost miraculous logistic support afforded our Armies around the globe. Almost all key positions in this logistical organization—which in magnitude has no parallel in the world's history—were held by officers who had been developed largely by their training in the peacetime civil works organization of the Army Corps of Engineers and other positions of great responsibility to which they were called because of the capacities which their previous training in this field had generated. That they would have been able in such numbers and to such a high degree to develop such capacities through any "detail system" or through any agency other than one organic to the Corps itself is highly questionable.
>
> Karl C. Dod

Source: Historical Division, OCE, Quotable Quotes.

The Military - Civil Mission

The importance of the Military - Civil Mission as seen by Secretary of War Dwight F. Davis in 1927:

> The record of . . . the Army Engineers in the civil work of the government is a matter of great pride to me . . . there has been developed in the Corps of Engineers a capacity for team work which I do not believe is equalled, and which certainly is not surpassed, in any private or governmental organization. . . . The valuable services of Engineer Officers on civil works can really be regarded as a by-product of national defense. From this standpoint they may be said to have been obtained with little additional cost to the government. A Corps of Engineers . . . must be maintained irrespective of whatever other duties their members perform. . . . Civil work is an exceedingly valuable but inexpensive by-product of military duties, and, at the same time, officers of the Corps of Engineers are getting valuable war training without added expense to the country. . . . It would be economically absurd to fail to use this experienced, trained force, educated largely at public ex-

pense, for duties which they and their predecessors have performed with conspicuous success for over a century. . . . The best interests of our waterways demand that the engineering data on which success or failure depends be obtained by men who are absolutely free from political or local influences. The Army engineer . . . unaffected by political changes of administration . . . has always given this bit of unbiased service.

Karl C. Dod

Source: Historical Division, OCE, Quotable Quotes.

Washington's Devout Wish

One of George Washington's life-long dreams was a well-developed system of navigable waterways, promoting commerce and binding the country together. Both before and after the Revolution, he was a leading advocate of river and harbor improvements and an active promotor of plans for building canals.

Returning in the fall of 1783 from a tour of the Mohawk Valley, he wrote to a friend concerning the nation's natural waterways:

> Prompted by these actual observations, I could not help taking a more extensive view of the vast inland navigation of these United States and could not but be struck by the immense extent and importance of it, and with the goodness of that Providence, which has dealt its favors to us with so profuse a hand. Would to God we had wisdom enough to improve them.

Lenore Fine

Source: Ltr to the Chevalier de Castellux, 12 Oct 1783.

☆US GOVERNMENT PRINTING OFFICE : 1988 O - 220-816

572 Feet high - Setting the Cap-stone on the Washington Monument - 1884